

COMPTON'S
PICTURED ENCYCLOPEDIA
AND
FACT-INDEX

INTERESTING • ACCURATE • UP-TO-DATE



*To inspire ambition, to stimulate the
imagination, to provide the inquiring
mind with accurate information told in
an interesting style, and thus lead into
broader fields of knowledge — such is
the purpose of this work*

VOLUME 10

F. E. COMPTON & COMPANY • CHICAGO

1944 EDITION

COPYRIGHT 1944 BY

F. E. COMPTON & COMPANY

*Imperial and International
Copyright secured. All rights
reserved for all countries.
Translation into foreign lan-
guages, including the Scandi-
navian, specifically reserved.
Printed in U. S. A.*

••

COPYRIGHT BY

F. E. COMPTON & COMPANY

1922, 1923, 1924, 1925,
1926, 1927, 1928, 1929,
1930, 1931, 1932, 1933,
1934, 1935, 1936, 1937,
1938, 1939, 1940, 1941,
1942, 1943, 1944

Here and There in This Volume

AT ODD TIMES when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. With this as a guide, you may visit far-away countries and watch people at their work and play, meet famous persons of ancient and modern times, review history's most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment. This list is not intended to serve as a table of contents, an index, or a study-guide. For these purposes consult the Fact-Index and the Reference-Outlines.

For the Reading and Picture Hour

ON THE ROAD TO NATURE STUDY—SOME INTERESTING PICTURES	29
HOW THE OCEAN SAVED LEYDEN FROM THE SPANIARDS	73
THE DREAM OF CHIEF WINNEMUCKA	79
PICTURES OF LIFE UNDER THE SEA	195
ODIN, THE FATHER OF THE GODS OF SCANDINAVIAN MYTHOLOGY	202
SOME ADVENTURES OF THE GREAT-HEARTED ODYSSEUS	204
THE STORY OF THE OWL	256

Parent and Child; School and Home

NERVES—THE TELEPHONE SYSTEM OF THE BODY	64
NOUNS—THE WORDS THAT NAME	179
HOW MEN LEARNED TO USE NUMBERS	184
OBEDIENCE	192
OPTIMISM	236

Tours Through North and South America

WHERE THE PEOPLE OF TWO NATIONS GO TO PLAY	15
WHERE AMERICA IS NEAREST TO EUROPE	82
THE QUEEN CITY OF THE SOUTH	100
TOWER-TOPPED MANHATTAN—THE METROPOLIS OF THE WESTERN WORLD	123
AMERICA'S ROARING WATER GIANT, SOURCE OF BOUNDLESS POWER	137
NICARAGUA, LARGEST OF CENTRAL AMERICAN REPUBLICS	140
THE NORTHERN HALF OF THE NEW WORLD	150
THE INDUSTRIAL HEART OF THE CANADIAN DOMINION	226
THE RIVER WITH HALF A HUNDRED OUTLETS	250

The Story of the States

THE FERTILE PRAIRIES OF THE "CORNHUSKER STATE"	57
RUGGED NEVADA, RICH IN TREASURE	76
THE "GRANITE STATE'S" PLAYGROUNDS AND WORKSHOPS	85
NEW JERSEY, THE "GARDEN STATE"	89
NEW MEXICO—WONDERLAND OF RUGGED BEAUTY	94

HERE AND THERE IN THIS VOLUME

WEALTH AND POWER OF THE "EMPIRE STATE"	113
NORTH CAROLINA, THE "OLD NORTH STATE"	155
THE WHEAT-CLAD PLAINS OF NORTH DAKOTA	161
IN THE BONNIE BUCKEYE STATE OF OHIO	209
INDIANS AND WHITES IN OKLAHOMA'S HISTORY	215
SCENES OF GRANDEUR AND VISTAS OF OPPORTUNITY IN OREGON	243

Travel-Views of Lands Across the Seas

ITALY'S NOISIEST, MOST PICTURESQUE, AND FASCINATING CITY	4
LITTLE HOLLAND'S PICTURESQUE LAND AND PEOPLE	66
THE PROGRESSIVE DOMINION OF NEW ZEALAND	135
"OCEAN-GIRDED NORWAY"—THE RUGGED LAND OF THE MIDNIGHT SUN	171
VENERABLE OXFORD AND ITS FAMOUS UNIVERSITY	258

Some Famous Men and Women

THE CORSICAN WHO CONQUERED HALF OF EUROPE	5
ENGLAND'S GREATEST SEA FIGHTER	63
THE MAN WHO DISCOVERED THE LAWS THAT RULE THE UNIVERSE	110
FLORENCE NIGHTINGALE, THE ANGEL OF MERCY	145

In the Plant and Animal World

THE OAKS, STately MONARCHS OF THE WOODS	189
THE ORANGE—A FRAGRANT BLOSSOM AND A HEALTHFUL FRUIT	238
THE APPETIZING OYSTER AND ITS TROUBLED CAREER	262

Marvels of Science and Invention

WHAT THE DOCTOR USES TO RELIEVE PAIN	12
LOOKOUT POSTS FOR STUDYING THE STARS	193
HOW THE ORGAN "BREATHES" AND "SINGS"	249

The World at Work

UNCLE SAM'S SCHOOL FOR NAVAL OFFICERS	44
THE WORLD'S HISTORY—DAY BY DAY—DELIVERED AT YOUR DOOR	104
THE MAKING OF OLEOMARGARINE	221

Guide-Posts to Literature, Art, and Music

THE STORY-TELLER AND HIS MAGIC CARPET	181
DRAMAS SET TO MUSIC—THE HISTORY OF OPERA	228
THE MUSICAL MARVEL WE CALL THE ORCHESTRA	240

Rambles Through Factland

GRIM GUARDIAN OF THE SEAS—THE STORY OF THE NAVY	50
NITROGEN, PRESERVER AND DESTROYER OF LIFE	147

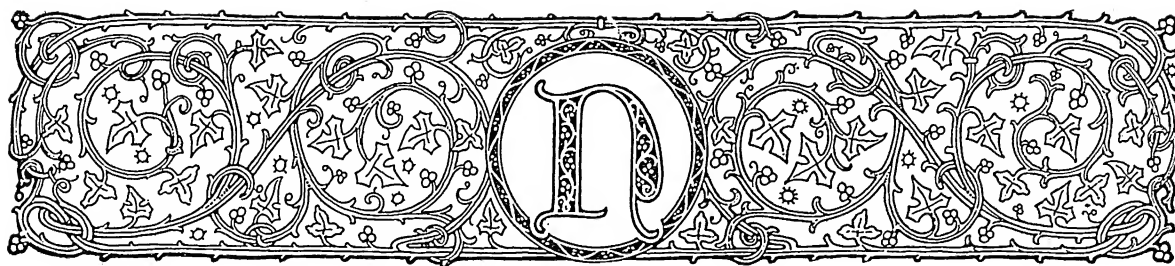
HERE AND THERE IN THIS VOLUME

Interest-Questions Answered in This Volume

- Explain the saying: "God made the world, but the Dutch made Holland." 69.
- Which of the land animals is the champion swimmer and diver? 255.
- How is it possible to "plant" oysters? 265.
- What creature builds new houses as he grows? 44.
- What makes light on the floor of the ocean? 198.
- What are "spats"? 262.
- What animal of the United States carries its young in a pouch, as the kangaroo does? 235.
- What is the northernmost town in Europe? 176.
- Why are there few good harbors on the east coast of the United States below New York? 153.
- What famous ship was rebuilt with the pennies of school children? 56*e* picture.
- Where is there danger of falling up? 198.
- Explain the origin of Niagara Falls and Gorge. 138, 139 picture.
- How does it happen that North Carolina has two coast lines? 156.
- Where are the Staked Plains? 96.
- Where do people really live in trees like birds? 84 picture.
- What state has the smallest population? 76.
- What color is pure sea water? 201.
- Why was it fortunate that America was discovered on its Atlantic coast? 150.
- Why was Cincinnati called "Porkopolis"? 212.
- In what Central American country has the United States the right to build another interocean canal? 141.
- Where is Hawthorne's "Great Stone Face"? 85 picture.
- Did Nero really "fiddle while Rome burned"? 64.
- Was Napoleon a Frenchman? 5.
- How did the character of Nicholas II affect European history? 142.
- How did the "novel" get its name? 181.
- When and where did opera have its beginning? 228.
- What bird lays a three-pound egg? 253.
- In what way does the owl benefit the farmer? 256.
- What is meant by the term "capital ship"? 53.
- What orchard tree does not come into bearing until it is 30 years old? 223.
- Why did a mythical Greek hero pour wax in his sailors' ears? 205.
- Why do some plants enrich the soil in which they grow? 147.
- Who was Siegfried? 140.
- Does a native-born American woman lose her citizenship when marrying an alien? 27.
- How accurate is the time given by the Naval Observatory at Washington? 193.
- To what one factor do American newspapers owe almost three-fourths of their income? 107.
- When were the first Olympic games held in Greece? 224.
- How are new stars discovered? 194.
- What are the "dark spots" in the Milky Way? 60.
- What causes the characteristic odor and flavor of the onion? 225.
- How did New York City's Bowery get its name? 126.
- What was the last numeral to be invented? 184-5.
- Why are dogs used instead of horses in Holland for delivering milk? 70.
- Why is the sea salty? 196.
- Whom did Napoleon call "a nation of shopkeepers"? 10.
- How did the United States get its nickname, "Uncle Sam"? 143.
- What accident brought about the discovery of the varied life at the bottom of the sea? 198.
- In what European country is half the land below sea level? 66.
- Why are Scandinavia and Alaska warmer than the same latitudes on the east side of the continents? 200.
- What is the secret of Egypt's fertility? 146.
- What keeps the temperature of the oceans low? 201.
- What is the human body's "telephone system"? 64.
- How many instruments make up a modern symphony orchestra? 241.
- Who cared for the sick during the Middle Ages? 186.
- How small may the pipes of an organ be? 248.
- Why do the Dutch wear wooden shoes? 70.
- What song furnished the nickname for the Union soldiers in the Civil War and the American troops in the first World War? 24.
- What is the most abundant and widely distributed substance in the world? 261.
- What great work was done by Florence Nightingale? 145.
- How did being blind in one eye help a famous English naval officer to victory? 63.
- What great empire did Rurik the Northman found? 167 picture.
- Where and when were the Spaniards defeated by the ocean? 73-4.
- What did Napoleon consider his true glory? 9.
- How did Napoleon III become emperor? 11.
- In what colony were 16 languages and dialects spoken when it had but 1,000 inhabitants? 120.
- Why do so many people have the name "Smith"? 2.
- Why did Sir Isaac Newton play with soap bubbles? 111 picture.
- Why do we count by tens? 184.
- How do orchids grow? 243.
- What kind of warship has all its funnels and turrets on one side? 56*a* picture.

Key to Pronunciation

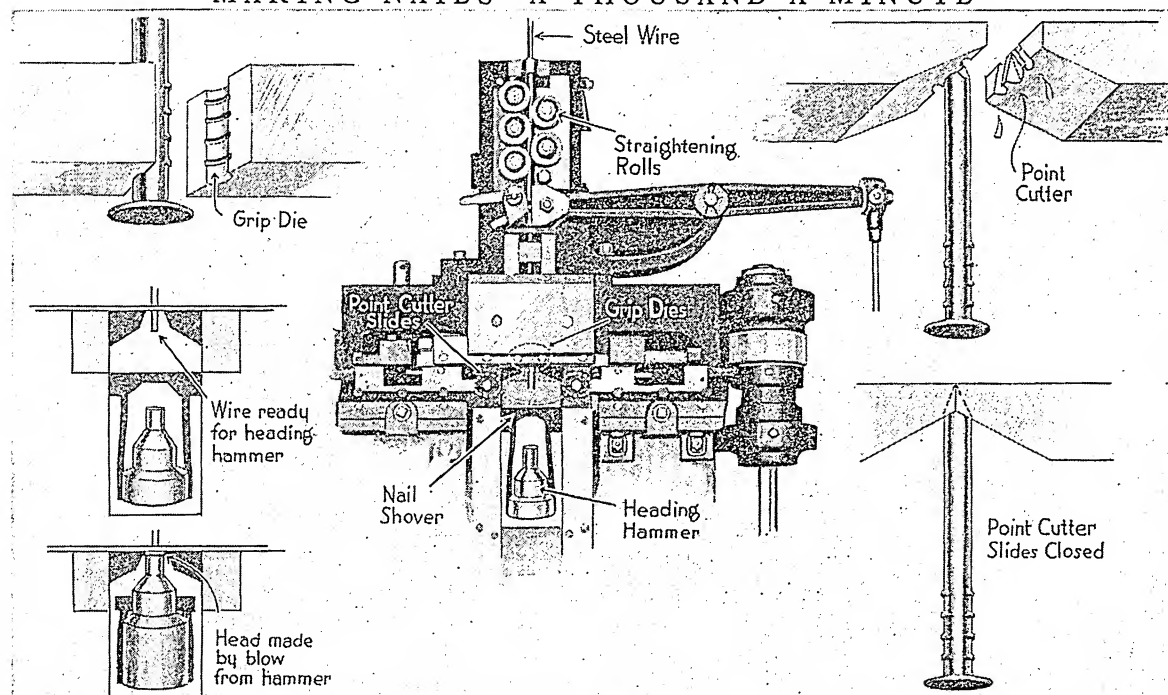
Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index. Marked letters are sounded as in the following words: *cāpe, āt, fār, fāst, whāt, fāl*; *mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rūde, full, būrn*; *ü* = French *u*, German *ü*; *gem, gō*; *thin, then*; *ñ* = French nasal (*Jean*); *zh* = French *j* (*z* in *azure*); *κ* = German guttural *ch*.



NAGOYA (*nä'gō-yä*), JAPAN. Nagoya is the third of the important cities of Japan. It is situated 30 miles from its port on the Grand Trunk Railroad, 235 miles from the capital, Tokyo, and about 94 miles from Kyoto. Nagoya is famous for its potteries, and a dozen miles distant is Seto, where the first glazed pottery was made in Japan after its secret had been learned in China in 1229 by Kato Shirozaemon.

NAILS. Did you ever see a nail-making machine at work? At one end soft steel wire is reeled into it at a tremendous rate, at the other end it pours out a stream of bright nails—a thousand a minute—with a roar like a machine gun or a steam riveter in action. Powerful nippers cut the wire into the required length, pliers fashion the point, and the head is formed by a hammer which strikes a terrific blow on

MAKING NAILS—A THOUSAND A MINUTE



This group of pictures shows you how wires are made into nails. After entering the machine and passing through the straightening rolls, the wire is caught by the grip die, which puts on the studs. Then the cutter closes upon the wire and cuts the point, while the heading hammer comes up against the lower end and flattens out the head. As soon as made, the nails are knocked off from the parent wire by the "nail shover," and fall into a basket at the rate of one thousand a minute!

For several centuries Seto maintained its supremacy in the pottery industry, and during the 19th century in the manufacture of porcelain. This industry is now, however, located chiefly at Nagoya, where there are also cotton mills and kindred industries, like that of dyed silk and cotton fabrics. Nagoya is also the home of the exquisite enamels of Japan and it was in Nagoya that the first "Cloisonné" ware was made. The most interesting building is the castle of Nagoya's feudal rulers, the Owari, now an art museum. Nagoya is a distinctly modern industrial city with a population of about 1,335,000.

the other end—and the whole nail is finished in a fraction of a second.

What a difference from nail-making in Colonial days, when every nail was laboriously hammered out by hand on an anvil! Many of the country folk of New England had small forges in their chimney corners, and there, on winter days and in the long evenings, when little other work could be done, quantities of nails were made, even by the older children. The nails were forged from "nail-rods" heated on the small hearth, and hammered and cut into the proper length. The heads were formed by

dropping the spike into a hole in a piece of steel just deep enough to leave a small portion projecting to be hammered flat. No wonder nails were scarce and expensive in those hand-manufacturing days!

But now all we have to do is to insert the end of our coil of wire into the machine, turn on the power, and from time to time place a new keg to catch the nails as they stream out at the rate of from 100 to 1,000 a minute, depending on the size. Without this wonderful machine it would be impossible to furnish the nails needed in modern buildings. In the United States so many wire nails (to say nothing of other kinds) are used that if all those made in a year were cast into a single nail, that gigantic nail would be higher than the Eiffel tower.

The first man to invent a nail-making machine was Ezekiel Reed, a Massachusetts man who took out a patent in 1786. His machine in an improved form is still used for making cut nails. Strips of metal the thickness of the nail are fed into the machine, and a "slicer" cuts them into square-sided nail lengths, which are firmly clutched at the neck until the upper end is hammered into a head. These cut nails taper, but are not pointed.

About a century after the invention of this machine, the wire nail came into general use, almost driving out the cut nail, although the latter holds better and is more durable. About 13 times as many wire nails are now produced as cut nails. Common screws for cabinet and carpenter work—which are really only a form of nail—are made by automatic machines much like those that make nails.

Nails for shoeing horses are still for the most part hand-forged from fine grades of wrought iron. They must be tough and of the same composition throughout, so they will not break off in the horse's hoof.

Wire and cut nails are made of various metals—iron, brass, copper, zinc, etc.—and in a great variety of form, according to the purpose for which they are intended; as, for example, shingle nails, finishing nails, barbed box nails, flooring nails, boat nails, trunk nails, and picture nails. They are usually sold by weight, the price increasing as the nails grow smaller, and are distinguished in size as *twopenny* (1 inch), *threepenny* (1¼ inches), *fourpenny* (1½ inches), and so on up to the *60-penny*. Nails less than an inch long are called tacks and brads; those larger than the 60-penny size are called spikes. New England is the center of the nail industry, and Taunton, Mass., is the world's tack-making center. **NAMES, PERSONAL.** "Who Won the War? The Smiths!" This curious newspaper headline, which appeared after the close of the first World War, was a humorous way of introducing the fact that there were 54,180 men by the name of Smith in the American Expeditionary Forces. The Johnsons, however, were not far behind, as the army lists showed 41,580 by that name. There were 29,960 Browns, 28,140 by the name of Williams, 25,720 of the Jones family, and 25,620 Millers.

Why should there be so many persons who bear these names? Let us find out by going far back into the history of names—one of the most fascinating and romantic of studies, because every name has a meaning and a story of its own, if only we search carefully enough.

In very early times, each person had only one name—his "given" name—which he might receive at the time of birth or later. Thus we are told in the Bible that when Hannah bore a son in answer to her prayer she named him Samuel, meaning "God hath heard." So Isaac meant "laughter"; Isaiah, "salvation of Jehovah"; Solomon, "prince of peace." In savage society names were frequently changed, just as nicknames arise with us. Thus an Indian brave who was called at birth "Morning Cloud" might in later life be known as "Deer Slayer," in commemoration of some exploit.

Where men lived in small tribal groups, this single name was enough. But in larger communities there would be many by the same name, and so it became customary to add some qualification—perhaps the name of the father—as a distinction. Thus you could distinguish between two men of the same name by calling one Demosthenes "the son of Clinias," and the other Demosthenes "the son of Socrates." With the Romans this practice developed into the use of genuine "family names," which descended to all members of the same house, in addition to the "personal name" borne by the individual.

Origin of English Family Names

Family names did not arise as a usual thing until after the time of the Conquest (1066), and so genealogies which purport to trace descent back of this date are nearly all frauds. There were so many Johns and Samuels and Williams with nothing to distinguish between them that it became convenient to refer to a man as John the *smith*, John the *mill*, or John the *carpenter*, and so presently these designations became fixed as surnames or family names. The names Taylor, Wright, Turner, Clark (clerk), Cook, Carter, and Gardiner are a few of the many derived in this way from occupations. The reason there are so many Smiths today is that in medieval times the name was applied to all workers in or *smiths* of metal—blacksmiths, who worked in iron, white-smiths, who worked in tin, locksmiths, etc.

Another common way of forming surnames was from the Christian name of the father. Such names are called *patronymics*, meaning "father-names." Johnson is simply "John's son," and Jones and Jennings are modified forms of the same surname. Williams, Williamson, and Wilson all mean "the son of William."

The name Brown was first given to a man as a nickname because of his complexion, or possibly because of the color of his dress. In like manner the names Long, Short, White, Little, Longfellow, and Cruikshank were derived from personal characteristics. Other names were derived from the place

where a man lived or from which he had come, as Hill, Cliff, Field, Whitfield, Dale, Ford, Lake, Wood, Atwood, Wells, Moore, as well as Scott, English, Ireland, Irish, France, French.

Animals have given us many of our surnames, partly because of the ancient custom of using signs instead of numbers to distinguish shops and inns. Thus a man might become known as Lyon (lion) either because of his courage or because the sign hanging before his shop bore the figure of a lion. Other familiar examples are Bull, Hart, Lamb, Stagg, Peacock, Swann, Fox, and Badger.

Surnames Built from Bible Names

Biblical characters and saints have furnished many surnames. Adam has given the familiar names Adams, Adamson, Ade, Atkins, and Atkinson, all of which mean "the son of Adam." From Elijah come Ellis and Eliot; from Matthew, Matthews and Mayo; from Andrew, Andrews and Anderson. Names of saints are very common, such as Gregory, Martin, Lawrence, Nicholas, Vincent, and Austin (from Augustine). Mitchell is a derived form of Michael, one of the archangels. Phelps comes from Philip.

Some names have come from buildings, as Temple, Hall, House, and Church. From the seasons we get Winter, Summers, and Somers. From points of the compass come North, Southey, Eastman, West.

Thus we see that there was once a reason for every name, though some names are very ill suited to the descendants who bear them now, as the writer of the following verses points out:

Men once were surnamed from their shape or estate
(You all may from History worm it);
There was Lewis the Bulky, and Henry the Great,
John Lackland, and Peter Hermit.
But now, when the door-plates of Mist'ers and Dames
Are read, each so constantly varies
From the owner's trade, figure, and calling, surnames
Seem given by the rule of contraries.
Miss Joy, wretched maid, when she chose Mr. Love,
Found nothing but sorrow await her;
She now holds in wedlock, as true as a dove,
That fondest of mates, Mr. Hayter.
Mr. Oldcastle dwells in a modern-built hut,
Miss Sage is of madcaps the archest;
Of all the queer bachelors Cupid e'er cut,
Old Mr. Younghusband's the starchest.
Mr. Child, in a passion, knocked down Mr. Rock,
Mr. Stone like an aspen-leaf shivers;
Miss Poole used to dance, but she stands like a stock
Ever since she became Mrs. Rivers;
Mr. Swift hobbles onward, no mortal knows how,
He moves as though cords had entwined him;
Mr. Metcalfe ran off, upon meeting a cow,
With pale Mr. Turnbull behind him.

The Macs, the O's, the Aps, and the Fitzes

In most foreign languages surnames are formed in much the same ways as in English. Corresponding to the English suffix *-son*, we find the Scotch prefix *Mac*, the Irish *O'*, the Norman-French *Fitz*, and the Welsh *Ap*, which give us the names Macdonald, O'Brien, Fitzherbert, and Bowen (originally Ap-Owen). The Russian suffix *-ovitch* likewise means "son," hence the Russian name Ivanovitch, son of

Ivan, or John, corresponds to the English Johnson. The Swedish *-son* and the Danish and Norwegian *-sen* are seen in a very large percentage of Scandinavian names. It is only within the last century that the practice has died out in the Scandinavian countries of giving the son a surname formed from his father's Christian name. Thus for example, in former times, if Hans Petersen had a son he would name him Ole Hansen, while the latter's son would be Jan Olesen.

One of the most interesting groups of names is that which includes Jewish names of German origin. Until the beginning of the 19th century Jews for the most part adhered to the ancient custom of using only a given name. When laws were passed in Austria, Prussia, and Bavaria to compel all Jewish families to adopt fixed surnames, some chose personal names such as Jacobs, Levy, Moses; others formed place-names, as Speyer (spires), Hamburg, Frankfurter. The famous Rothschild family got its name from the red shield over Nathan Rothschild's shop in Frankfurt. Many took highly colored and poetical names such as Rosenberg (rose-mountain), Gluckstein (luck stone), Rubenstein (ruby), Goldenkranz (golden wreath). Animal names were also favorites, as Adler (eagle), Hirsch (hart), Lowe (lion), Fuchs (fox), and Wolf.

NANKING, CHINA. More than 2,000 years ago, Nanking was an important city, and in the course of its varied history it has seven times been the capital of China. Its name means "southern capital." The city's greatest glories began in 1368 under the first Ming emperor. He saw the long undulating line of hills rising from the bank of the Yangtze River like the sacred dragon's body, and decided that on the dragon's back he would build his capital. A wall 28 miles long, 60 feet high, and about 30 feet thick was built around it. The famous white porcelain pagoda, whose five large pearls were believed to safeguard the city from danger, was begun in 1413. During the Taiping Rebellion in 1853 the pagoda, palaces, and a part of the walls were destroyed.

In the 20th century Nanking took on new life, for it was here in 1912 that China was proclaimed a republic. In 1928 Nanking again became the capital. High on near-by Purple Mountain, the Nationalist government built the tomb of Sun Yat-sen, first president of the republic. The glistening white marble structure looked down upon a modernized Nanking. The rebuilt city became a large trade center of the populous Yangtze Valley, and its factories produced silk goods, paper, porcelain, brassware, tapestries, and a cotton cloth named "Nankeen" after the city.

But in 1937, when Japan invaded China, Nanking was all but destroyed. Japanese troops burned and pillaged the city in an especially ruthless attack. Most of the population of some 1,000,000 fled, and Nanking University and Southeastern National University were removed to the interior. In 1940 Nanking, still in ruins, became the capital of Wang Ching-wei's régime, a puppet government sponsored by Japan.

NANTES (nānt), FRANCE. Dating from the Celtic Namnetes who ruled here before the Romans, this city is best known for the Edict of Nantes by which Henry IV in 1598 granted toleration and civil



rights to the Huguenots or French Protestants (see Henry, Kings of France). Although it is 50 miles from the sea, it is an important port of France. Its position on the Loire River, which has been improved as a waterway, makes it a center for commercial waterborne traffic. The leading industries are shipbuilding and the manufacture of sugar, oil, textiles, machinery, food products and iron products. Nantes contains a number of historic public buildings, among them a beautiful cathedral and a medieval castle. Historically, it is one of the chief cities of Brittany. During the first World War several American hospitals were established here. Population, about 195,000.

NAPLES, ITALY. To catch the spirit of Naples the visitor must see it first as he sails between the islands of Ischia and Capri, and enters the celebrated Bay of Naples, some 22 miles wide. There at the northern apex of the bay lies the noisiest, most picturesque, and most fascinating of Italy's historic cities. As the ship plows forward, through the bluest of waters under the bluest of skies, the sloping city appears, flanked seven miles to the east by the ominous bulk of Mount Vesuvius, and on the west by the graceful heights of Posilipo. In the background an amphitheater of volcanic hills curls around the city, which has been called the most beautifully situated in all Europe. To the lovely island of Capri go 30,000 tourists every year, to enjoy the balmy air and the picturesque scenery and to view the ruins of the palaces in which the profligate emperor Tiberius spent the last seven years of his life.

From a crest north of the city, where stands the massive bulk of St. Elmo Castle, built in the 16th century and now used as a prison, a spiny ridge runs down to the sea, splitting the city in two. This ridge ends in a rocky islet, on which stands the Castello dell' Ovo—so called because it is egg-shaped—built in the 12th century.

In the older and larger part of the city, to the east of this ridge, the spires of scores of ancient churches rise, intermingled with large public buildings, and here and there a factory chimney. In this quarter the poorer people live, and here centers the industrial and political life of the city. On the western side of the ridge are the new fashionable dwellings of the rich, built on terraced hills and commanding sweeping views of the bay, with the twin mountains of famous Capri in the far distance.

How Naples Suffered from Growing too Fast

Naples is said to be the most densely populated European city. During the last century its population increased at a rate far more rapid than did its dwelling places, and for many decades the poorer people were crowded together so thickly that disease, crime, and vice flourished hopelessly in filthy tenements. In 1884 a fierce epidemic of cholera broke out which carried away thousands of victims. Shortly afterward the center of the old district was literally torn out by the roots. Modern buildings and broad streets were built, an excellent water supply was

pipied in, and conditions improved at once. Even today the thriving business carried on by its factories, and the immense exports and imports which pass through its magnificent harbor, continue to draw people to Naples. Dwellings are crowding out the beautiful gardens and groves, while the expansion on the outskirts bids fair soon to connect the pretty chain of small suburbs on the shores of the bay into one huge city.

Naples is a center for the manufacture of silks, cottons, and woollens, glass, coral, tortoise shell, and other art objects, kid gloves, tobacco, olive oil, soaps, perfumes, chemicals, and macaroni. Machinery, guns, and other objects of steel and iron are growing in importance; and wine is an important export. But a carefree spirit seems to mark the city's industrial life. The workers from the factories, the peddlers pushing their carts in the markets with shrill cries, the mule drivers from the surrounding country bringing in their produce, the fishermen from the nearby villages—all mingle together in the streets in a gay and noisy throng, shouting, waving arms, singing and laughing—all this presents a scene not matched anywhere in the world.

A Population of Art Lovers

The instinctive love of beauty which is characteristic of the Neapolitans is reflected not only in their picturesque costumes, but in their appreciation for serious art. Naples is filled with museums, theaters, and opera houses, among which is San Carlo, one of the largest opera houses in Europe, where many of the best singers in the world may be heard.

Many remains of classical days add to the city's historical interest. The cathedral, one of the principal edifices, dates back to 1272, and stands on the spot where were formerly two temples dedicated to Neptune and Apollo. Naples was one of the earliest centers of learning in Europe. The University of Naples was opened in 1224 by Frederick II, Holy Roman emperor, to draw students away from the University of Bologna. The National Museum of Naples is one of the most important in the world. In it are housed objects dug up at Pompeii and Herculaneum and unequaled Greek and Roman relics, as well as collections belonging to the Italian crown, the Farnese group of paintings and sculpture, and 600,000 books, pamphlets, and manuscripts containing many rare historical writings. A big Marine Aquarium contains the largest collection of living sea animals in the world and its laboratories attract zoölogists from all parts of the globe.

Naples was an old Greek settlement (called *Neapolis*, "the New City"), founded about 450 B.C., when southern Italy and Sicily were styled *Magna Graecia* ("Greater Greece"). The Romans conquered it in 326 B.C., but the Greek language and customs survived down into the days of the Roman Empire. It suffered in the 6th century when the generals of the eastern Emperor Justinian wrested it from the East-Gothic conquerors of Italy. The Normans con-

quered it about 1130, and it became the capital of the "Kingdom of the Two Sicilies," which these mighty descendants of the Northmen set up in southern Italy. It flourished greatly under the enlightened Frederick II, of the Hohenstaufen house, whose mother was the last of the Norman line. He it was who founded its university, and in this court, where mingled Greek, Saracen, Teutonic, and classical elements, the first stirrings of the Renaissance were manifest. With the pope's aid the descendants of Frederick II were finally overthrown and Charles of Anjou was seated on the throne (1266).

For centuries this territory was then the scene of violent intrigue and war. From 1266 until 1494 it was fought over by Angevin and Aragon princes; then the kings of France and Spain alternately took possession, until the latter gained the ascendancy in 1504, ruling the Two Sicilies until 1713. After the War of the Spanish Succession (1701-13) the Two

Sicilies passed to the Austrian Hapsburgs, who surrendered it to a branch of the French house of Bourbon in 1743. While Napoleon Bonaparte was making Europe over, his brother Joseph sat for a time on the throne, and then Joachim Murat, Napoleon's brother-in-law. After Napoleon's fall Naples returned to the Bourbon government until it was liberated by Garibaldi and became a part of United Italy in 1861 (see Garibaldi; Italy).

A black spot in Naples' history was the *Camorra*, a secret society organized about 1820 to aid prisoners of the harsh Bourbon régime. But it soon degenerated into a band devoted to robbery, blackmail, smuggling, and assassination. At times it schemed with greedy Neapolitan leaders and gained control of the city government. Its power was not broken till 1912, when many Camorristi were imprisoned. Free from its evil sway, Naples became one of Italy's chief industrial cities and ports. Hence, during the second World War, it was bombed repeatedly by the British air force. The population of Naples, which is the capital of the department of Campania, is more than 900,000.



The CORSICAN Who CONQUERED Half of Europe

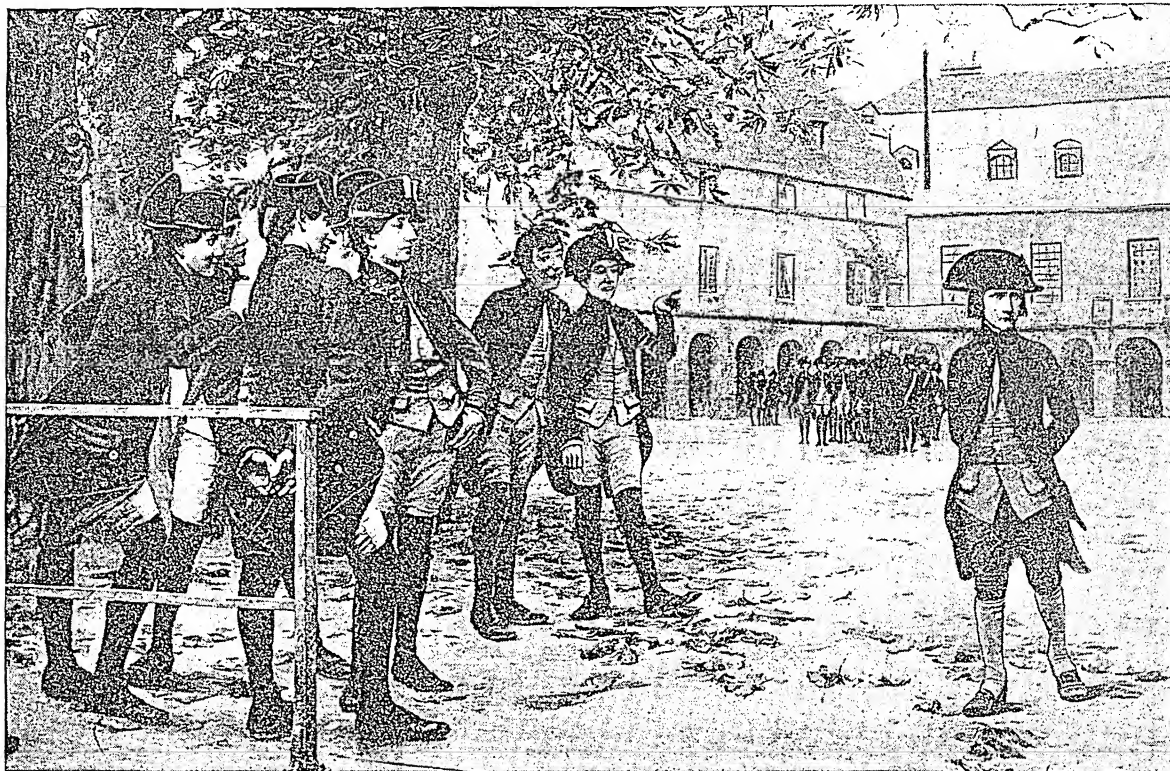
Napoleone Buonaparte—such was the Italian name under which he was christened—was a typical Corsican, "moody and exacting but withal keen, brave, and constant." For years his most intense emotion was hatred of France, which he regarded as an oppressor of his native land.

He carried this feeling with him to the government military school at Brienne, in northeastern France, to which he was admitted at the age of nine. His five years spent at Brienne were not happy ones and he frequently engaged in fights with the French lads who thought him a gloomy sullen lad. He spent his leisure in dreaming of the time when he should free Corsica. At the age of 16 he began his service in the French army as second-lieutenant of artillery. But his proud nature, his poverty, and his foreign birth and accent still cut him off from his fellows.

The stirring events of the French Revolution, which broke out in 1789, aroused little interest in him. His thoughts were all on Corsica, and he absented himself from the army for long periods to engage in plots at home. His schemes were not successful, however, and it was with difficulty that he escaped to France, an outcast from his native shores. His love for Corsica was thenceforth dead; it meant no more to him than did Malta or Corfu. There came a time when he declared, "Among all the insults hurled against me, that of 'Corsican' is the most mortifying." He gave his name its French form, and his marriage in 1796 to Josephine Beauharnais, the widow of a Frenchman, was another step away from his Corsican nationality.

N A P O L E O N (*nā-pō'lē-ōn*) I, EMPEROR OF THE FRENCH (1769-1821). Not a drop of French blood flowed through the veins of Napoleon Bonaparte, who for 16 years was the absolute master of France. He was barely a Frenchman by birth, for the island of Corsica, in which was located his native town of Ajaccio, was handed over to France by Genoa in 1768, only a year before Napoleon was born.

THE STRANGE BOY IN THE MILITARY SCHOOL



"The mighty tread of the Emperor's footsteps on the Continent soon drowned the echoes of the cannon of Trafalgar," wrote the French historian, Thiers, speaking of this moody and solitary boy who is here pacing the grounds of the military school at Brienne, to the amusement of his fellow students. At that time the great Napoleon was only a friendless alien who spoke French with an Italian accent, while his fellow students were sons of the aristocracy of France. Their taunts made his life miserable, and he grew to a morose and pessimistic young manhood.

Now that his boyhood ambition was gone, what was to take its place? Perhaps, for a time, nothing. In 1793, at Toulon, he first gave evidence of his energy and genius in directing the artillery in the siege of that rebellious French city. This fixed the attention of the leaders of the government upon him. "If you are ungrateful towards him," wrote his commanding officer, "this man will contrive his own advancement." But for a time fate was against him. Robespierre and the Jacobins, with whom he had established friendly relations, fell from power; and in 1795 Napoleon was back in Paris, deprived of his command, without money or friends and suspected because of his Jacobin connections.

That year was the last year of misfortune for a time. In October, with what Carlyle called a "whiff of grape-shot," he defended the Convention (the legislative body) against a radical Parisian mob. Everybody was amazed at his energetic arrangements, his clear and prompt orders. Amazement gave way to admiration, then admiration to confidence, and finally confidence to enthusiasm.

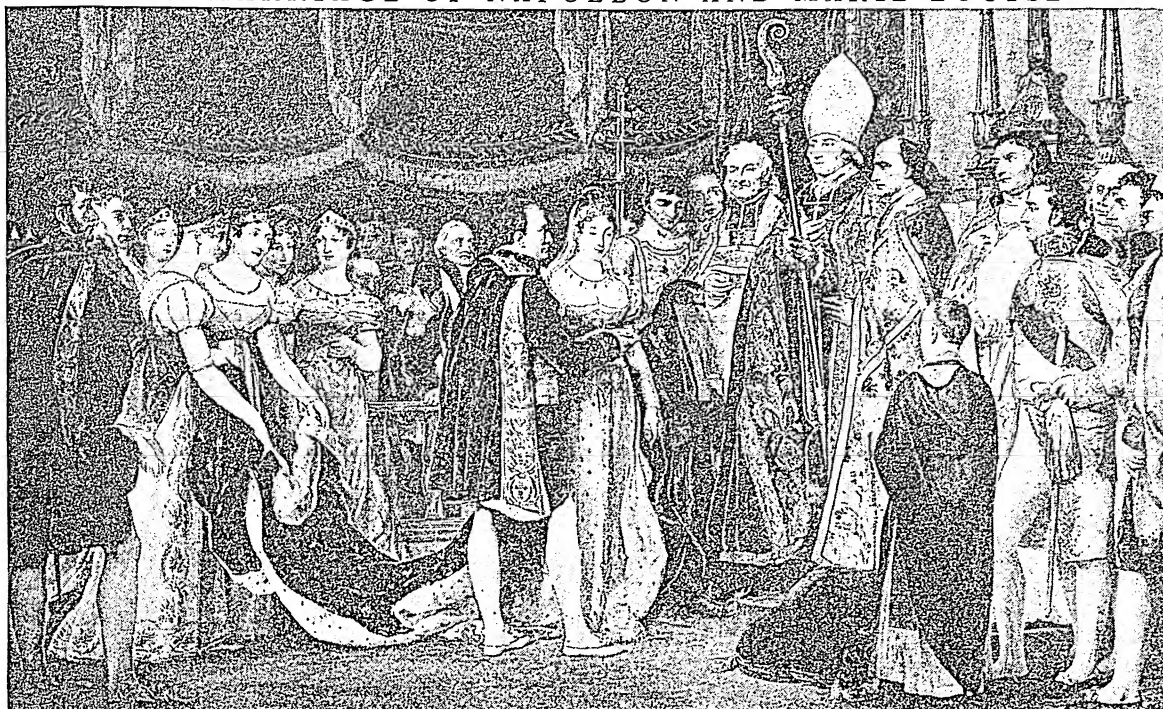
Marvelous Campaign in Italy

The Directory, which now sought to bring order into the Revolution, rewarded the young man with the pale face and unkempt hair by making him commander of the French Army of Italy, operating against

the Austrians and their allies. This appointment formed the opening of a military career which, in extent and grandeur, hardly finds a parallel in history except that of Alexander the Great. Of all Bonaparte's campaigns none is more interesting, perhaps, than this first one in Italy, in 1796-97. Even older and more experienced generals serving under him yielded to his indomitable will, his flashing eye, and his brilliant plans. His men were thrilled by the burning words of his first proclamation: "Soldiers, you are ill-fed and almost naked. The government owes you much, but can do nothing for you. Your patience and courage do you honor, but procure you neither glory nor profit. I am about to lead you into the most fertile plains of the world. There you will find great cities and rich provinces. There you will win honor, glory, and riches. Soldiers of the Army of Italy, will you lack courage?"

The campaign showed General Bonaparte's great military genius, and stirred to life again great ambition. His quick mind seized every geographical detail which might help or hinder his operations. He was prompt to guess the plans of his enemies, whom he bewildered by his rapid movements. His favorite device was to cut the enemy's army in two, and then throw his whole force against one of the enemy fragments before they had a chance to re-unite. By this

THE MARRIAGE OF NAPOLEON AND MARIE LOUISE



We are here witnessing the magnificent wedding of the great French Emperor to Marie Louise of Austria. Although the marriage was originally contracted for political reasons, following the Emperor's divorce of Josephine, Napoleon was desperately in love with this daughter of the Hapsburgs. Their only son was called Napoleon II and formally crowned king of Rome, but this was only an empty title after Napoleon was overthrown. After his first overthrow, Marie refused to join him in Elba and during the desperate Hundred Days expressed no interest in him. Nevertheless, Napoleon both excused and forgave her desertion.

method in 1796 he defeated the Sardinian troops five times in eleven days, threatened their capital (Turin), and forced their king to make peace.

Then Bonaparte turned eastward against the Austrians. His bravery was shown when in the face of a withering fire he forced his way across the bridge at Lodi—an exploit that won from his troops the affectionate name of the "Little Corporal." He then besieged a part of the Austrian forces in Mantua. Four times the Austrians sent armies across the Alps to relieve that fortress, but each time Bonaparte defeated them, and finally the fortress fell in February 1797. He then carried the war into Austria itself, and had advanced to within 80 miles of Vienna when the enemy offered to make peace. According to Bonaparte's proclamation, he had been victorious in 14 pitched battles and 70 combats. His army had conquered rich lands which fed and paid the army during the campaign, and sent millions of francs to relieve the financial distress of the home government. By the treaty of Campo Formio, which Bonaparte negotiated with Austria, France was given Belgium (the Austrian Netherlands), and accepted the Rhine as the eastern frontier of the republic and the Cisalpine Republic which he had erected in northern Italy. In return he gave to Austria most of the territories of the old Venetian Republic, which Bonaparte had high-handedly destroyed. All this he had done with an army of only about 50,000 men.

When the conqueror of Italy returned to Paris he was given a triumphal reception such as had been given to no other general of the Revolution. Thirst for political power had now replaced his youthful ambition for Corsica. "Do you suppose," he is reported to have said, "that I have gained my victories in Italy in order to advance the lawyers of the Directory?" But the "pear was not yet ripe for picking," he felt, and so, because he was afraid that the people might tire of him if they saw him too much, he meditated an invasion of England. He finally persuaded the willing Directory to send him to Egypt. There on the banks of the Nile he expected to imitate the exploits of Alexander the Great, and at the same time to strike a blow at France's most powerful enemy, England, by opening a route to India. But here he was doomed to disappointment. The Battle of the Pyramids, fought near Cairo (July 1798), put Egypt at his mercy; but his fleet was destroyed by the British in the Battle of the Nile at Aboukir Bay (see Nelson, Horatio), and he was cut off from reinforcements. At Acre, in Syria, British troops fighting alongside those of Turkey defeated Bonaparte's plans and threw him back on Egypt. At last disquieting news from France led Bonaparte to slip away from his army in Egypt and return secretly to France.

There he found the Directory discredited because of its disastrous wars in his absence. Bonaparte joined accordingly in a plot which in November 1799

overthrew the Directory and set up in its place a government called the Consulate, with Bonaparte as the first of the three consuls. Three years later he became First Consul for life with the right of appointing his successor. Thenceforth he styles himself "Napoleon I" instead of "General Bonaparte."

The pear was now ripe and had been picked. Napoleon had grasped political power and become master of France. His old ambition was realized, but already new ones were forming. He had failed to build up a great eastern empire like that of Alexander the Great. He now aspired to restore the western one of Charlemagne.

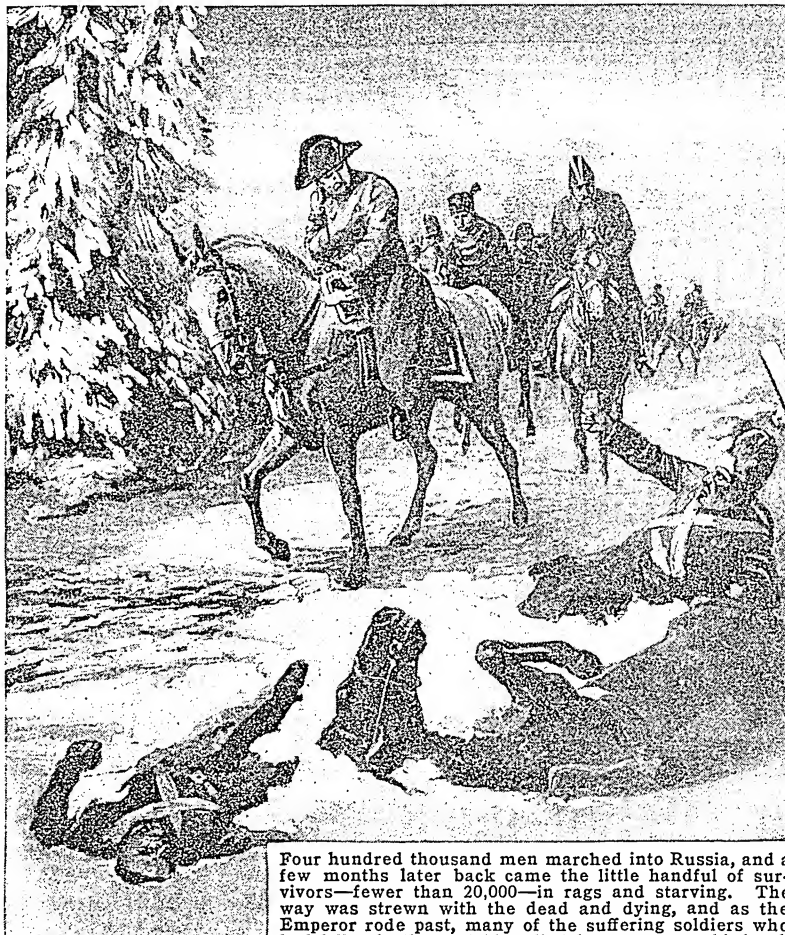
By the hard-fought battle of Marengo (1800) he defeated the Austrians. The German states and even England, worn out by war, were ready to give up the struggle, and by the treaty of Amiens, in 1802, France was at peace with the whole world for the first time since 1792. But even in peace the First Consul continued to carry out his ambitious plans. In the 14 months before the conflict began anew, he became president of the Italian Republic, intervened in Switzerland, annexed Piedmont, Parma, and the island of Elba to France, planned the partition of Turkey, and the foundation of a colonial empire which should include America, Egypt, India, and Australia.

Do you wonder that Great Britain felt compelled to renew the conflict and worked hard to build up the Third Coalition (composed of Great Britain, Russia, Austria, and Sweden) against this arch-disturber of the peace? But still Victory smiled on Napoleon. By his complete defeat of the Austrians and Russians at Austerlitz (Dec. 2, 1805), by his crushing blow to the Prussians at Jena (Oct. 14, 1806), and by the battle of Friedland against the Russians (June 14, 1807)—"the worthy sister of Marengo, Austerlitz, and Jena"—Napoleon brought most of Europe to his feet.

Only one obstacle apparently barred his way to the complete mastery of western Europe; that was Great Britain. In 1805 he had planned to invade that island and reduce it to submission. But the favorable moment never came and after England's navy under Nelson had destroyed the French fleet in the battle of Trafalgar (October 1805), Napoleon had no chance to conquer that enemy in battle, and his economic blockade of Britain proved equally futile.

Napoleon's fame rests not only on his military genius but also on his work as a statesman. He was obliged to make treaties, to reorganize the lands he had conquered, and to govern France. He had an inexhaustible appetite for work and an extraordinary capacity for it. He mastered the details of business

THE RETREAT FROM MOSCOW



Four hundred thousand men marched into Russia, and a few months later back came the little handful of survivors—fewer than 20,000—in rags and starving. The way was strewn with the dead and dying, and as the Emperor rode past, many of the suffering soldiers who had fallen by the roadside called down curses on his head.

with almost superhuman energy and intelligence. A sound currency was established in France, the Bank of France created, roads and canals improved, agriculture and industry fostered. The machinery for local government was simplified and strengthened by a system of departmental *prefects* and *subprefects*, appointed by his government at Paris. The Catholic church, which had been suppressed in the course of the Revolution, was reestablished by an agreement with the pope, known as the Concordat of 1801. Military ambitions were stimulated by the formation of the Legion of Honor, to be composed of soldiers and civilians who had greatly served the state. Most important of all, the old confused system of law was swept away, and Napoleon, with the aid of a committee of learned jurists, constructed a system of rational law—the Code Napoleon—to take its

“WHERE IS THE MAN WHO WOULD SHOOT HIS EMPEROR?”



This picture shows one of the most remarkable incidents in the career of Napoleon. It happened after he had escaped from Elba with a handful of soldiers and set out for Paris. As he approached the city of Grenoble, a general of the royal forces in command of 6,000 men was sent out to take him prisoner. On meeting them Napoleon dismounted and advanced alone. The order to "Fire" had already been given. But Napoleon, baring his breast, said: "Where is the man who would shoot his emperor?" At his words the soldiers who had been sent to stop him threw down their guns and hailed him as their leader.

place. "My true glory," said he after his downfall, "is not that I have gained 40 battles. Waterloo will efface the memory of these victories. But that which nothing can efface, which will live forever, is my civil code."

Step by step, too, Napoleon was building up his own position. In 1804 he secured a popular vote sanctioning a change from the consulate to an empire, with the title "Emperor of the French" and the right to hand down the throne to his descendants. In order to obtain a son to succeed him and also to ally himself with one of the old royal families of Europe, he divorced Josephine in 1809 and married Marie Louise, the 18-year-old daughter of the Austrian emperor. He set himself, also, to the work of reorganizing Europe. The Cisalpine Republic was now changed to a monarchy and he himself was crowned king of Italy with the famous "iron crown" of Lombardy. "Roll up that map of Europe; there will be no need for it for ten years to come," the English minister Pitt had said after the battle of Austerlitz. For almost that period Napoleon changed the map at his will. His stepson Eugene was made viceroy of Italy. Napoleon's brother Louis became king of Holland; and Joseph, king first of Naples and then of Spain—General Murat, who had married Napoleon's

sister, succeeding to the vacant Neapolitan throne. His dependents the dukes of Bavaria and Württemberg were given the rank of kings. The shadowy Holy Roman Empire was dissolved, in 1806, and many of the petty German states were given to their more powerful neighbors, until the number of German states was reduced from some hundreds to about 50. This was the first step in the consolidation of Germany. At the height of his power the French Empire included France to the Rhine, Belgium and Holland, parts of Italy, and Croatia and Dalmatia. Spain, the rest of Italy, the Grand Duchy of Warsaw, and the confederation of the Rhine were dependent on Napoleon, and Denmark and Norway, Prussia, and the Austrian Empire were allied with him. Only Great Britain, Russia, Sweden, and Turkey remained independent of him.

Napoleon freely used the schools to maintain his power. The political creed for the rising generation was set forth in a catechism to be taught in the schools in these terms: "We owe to our Emperor, Napoleon I, love, respect, obedience, fidelity, military service, and the tribute ordained for the defense of the empire and of his throne." In reply to the question as to what was to be thought of those who were unfaithful in their duties toward the emperor, the

catechism replied: "According to St. Paul they sin against the ordinance of God, and are guilty of everlasting damnation."

The high point in Napoleon's career was reached in the years which followed the peace of Tilsit (1807). There, on board a raft in the Niemen River, the Czar Alexander of Russia not only made peace but was won over to Napoleon's plans. Napoleon and Alexander were to divide Europe between them. In return Alexander was to aid Napoleon in his "Continental system." The object of this was to close Europe to England's commerce and thereby force that "nation of shopkeepers," as he contemptuously called it, to sue for peace. At one time or another every state of continental Europe, except Turkey and Portugal, was forced into this commercial system. But all objected to it, because they needed goods from England; and so all found methods of evading the conqueror's decree until they could throw off his yoke.

Napoleon had also aroused another great force, which was to bring about his downfall—the spirit of nationalism. In Spain the patriotic fire against French conquest first blazed forth in 1808. The British sent troops to help in this "Peninsular War" (1808-14), and little by little the French were pushed back beyond the Pyrenees.

The day of downfall was approaching. Austria plucked up courage to renew the struggle, but was crushed by the bloody battle of Wagram (July 1809). Then Napoleon struck back of her at Russia, for deserting his Continental system. With an army of nearly half a million men, drawn from "twenty nations," he plunged into that country. On and on he went into the heart of the country, until he finally reached Moscow. Suddenly the day after his arrival (Sept. 14, 1812) flames burst forth, probably set by the Russians, and nine-tenths of the city was reduced to ashes. It was impossible to winter in the ruined city, and on October 19 Napoleon began his retreat across snow-covered plains. This retreat from Moscow, celebrated in art and story, became one of the tragedies of history. Of the mighty force of 400,000

that had set out in June, less than 20,000 ragged, freezing, and starving men staggered across the Russian frontier in December.

Napoleon's great career of conquest was over. The flames of national patriotism burst forth in an uprising of Europe. Austria, Russia, and Prussia all joined with Great Britain in the War of Liberation.

With renewed effort Napoleon raised new armies and won a few unimportant victories; but in the three-days' battle of Leipzig—called the Battle of the Nations —(October 1813) the French were outnumbered, outgeneraled, and outfought. Slowly but surely the allies then closed in upon Paris — Russians, Prussians, and Austrians from the east and north, and the British and Spaniards from across the Pyrenees. On the last day of March 1814, they entered the French capital. Napoleon's generals refused to continue the hopeless struggle, and he was forced to abdicate (April 11, 1814). He was allowed to retain the title of Emperor, together with the little island of Elba (between the west coast of Italy and Corsica), and was promised an annual payment of 2,000,000 francs. In the person of

Louis XVIII the Bourbons returned to power.

But to remain quietly so near France without trying to regain his lost power was an impossibility for Napoleon. In March 1815, he slipped quietly away from Elba and landed in France. As by magic an army rallied to his support, and for a brief "Hundred Days" he enjoyed a return of his ancient glory. But the allies again united their forces against him and on the field of Waterloo he was decisively and finally defeated (see Waterloo, Battle of).

To avoid falling into the hands of Blücher, who had sworn to shoot him as an outlaw, Napoleon sought refuge on board a British man-of-war and surrendered. He was now sent to the lonely British isle of St. Helena, in the South Atlantic, 1,200 miles west of Africa. His wife Marie Louise deserted him and his only son was reared in Austria and died as the Duke of Reichstadt in 1832. At St. Helena Napoleon fretted out the remainder of his life, until his death from cancer in 1821, in quarrels with his guards.

THE FALLEN EMPEROR ON HIS "ROCK"



The man who had been master of Europe, who had made and unmade kings and emperors, spent his last days on a lonely island—St. Helena, 700 miles from the nearest land. Once the overlord of an entire continent, he came to be a prisoner who could not even call his own the barren bit of land to which he was exiled. "My rock!" he used to say with grim humor, in speaking of the island, yet he could not even take a walk without a British soldier at his heels.

NAPOLEON III, EMPEROR OF THE FRENCH (1808–1873). Royal birth, a princely heritage, an imperial name, a cardinal to christen him, an emperor and empress to stand his sponsors, early exile, persecution, youthful wanderings in search of a home, reckless invasions, miraculous escapes, imprisonments, and flights in disguises—these were the circumstances in the life of Louis Napoleon which eventually led him to the throne of France as Napoleon III.

His first period of youthful magnificence made little impression on the boy, for he was only two years old when his father, Louis Bonaparte, stepped down from the throne of Holland. When he was seven his uncle Napoleon I fell from his proud position and was exiled to the lonely island of St. Helena. Then began a long period of wandering in search of a home, Switzerland, Germany, England, and America all sheltering him for a time.

But wherever he was and whatever he did, he was always planning for the restoration to rule of the Bonaparte family in France. This was especially true after 1832, when the son of Napoleon I—the Duke of Reichstadt—died. This left Louis Napoleon as the next heir of the great conqueror.

So firm was his faith in his “star of destiny” that he twice made adventurous attempts to seize power in France, but these only brought ridicule upon himself. His opportunity came in 1848, when a revolution drove Louis Philippe from the throne and a French republic was established. Among the names of the candidates for the presidency of the new republic only one was known to the peasants—that of Louis Napoleon. They remembered only the glories of the rule of the first Napoleon, and forgot his costly wars and his despotism; so by an enormous majority they elected his nephew president.

Louis soon began to follow in the footsteps of his illustrious predecessor. In 1851 he overthrew the old constitution and made a new one giving him unlimited power for ten years. A year later he assumed the title of “Napoleon III, Emperor of the French,” the son of Napoleon I being counted as Napoleon II. All of these changes were submitted to the people for their approval in plebiscites, but the elections were carefully controlled so that the people would vote as Napoleon wished. Neither Napoleon I nor any Bourbon king could have been more absolute than was Napoleon III during the first eight years of the empire (1852–60). He muzzled the legislative body, he shackled the press, and he controlled the elections. But the people were ready to give up their liberty in return for the prosperity they enjoyed. Napoleon organized banks, built railroads, constructed canals, established hospitals, and gave the laboring men the right to strike. With England, Turkey, and Piedmont as allies, he also won a place among the nations by engaging in a successful war in the Crimea against Russia, in 1854–56 (see Crimea).

“The Empire is peace,” Napoleon had once declared, and if he had followed this policy all might

have gone well with him. But he longed to win military glory as Napoleon I had done, though he himself had no military training. The Franco-Austrian War in Italy in 1859 made for him many enemies (see Cavour, Count). His unsuccessful attempt to establish Emperor Maximilian in Mexico still further discredited him (see Mexico). In fact his whole foreign policy in the latter days of his empire was a failure.

In an effort to reduce the growing opposition to his rule he began granting political reforms. The period 1860–70 was thus one of new liberalism in the empire. The powers of the legislature were restored, and ministers responsible to it were appointed. Freedom of the press was granted. But his popularity was too far undermined for these concessions to save him. When France was crushingly defeated in the Franco-Prussian War, in 1870–71, the whole structure of the Second Empire toppled to the ground.

Napoleon himself was taken prisoner of war when the French army surrendered to the Germans at Sedan, on September 2. “Down with the Empire! Long live the Republic!” shouted the people in Paris, and on September 4 the Third Republic was born. The Empress Eugenie, his beautiful Spanish wife who had wielded a harmful influence on his reign, fled to England, and there Napoleon III joined her after his release at the close of the war.

So began his second exile, which lasted until his death, three years later. He so lacked the genius of Napoleon I that Victor Hugo called him “Napoleon the Little.” His name was his principal asset, and with his overthrow the Bonapartist cause was effectually destroyed. The Empress Eugenie, saddened by the death of their only son in a British war in South Africa, lived on in lonely widowhood until 1920.

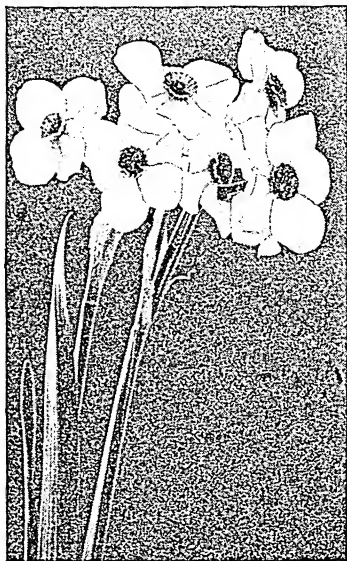
NARCISSUS. One of the prettiest sights of the Alpine meadows in springtime are the wide fields of the white or yellow narcissus which there grows wild. The blossoms, drooping from the end of a tall slender stalk, have an exquisite grace, and a rather spiritual beauty. Their fragrance is overpowering and can often be noticed a mile away. The plant is a native of southern Europe, northern Africa, Persia, China, and Japan. It was beloved by the ancients and about it cluster many myths and legends. Greek myths tell of a beautiful youth, Narcissus, who, because he had spurned the love of Echo, was condemned by Aphrodite to lose his heart to his own image reflected in a clear pool. Fascinated, he gazed day and night at the beautiful apparition and became weaker and weaker from lack of food, until he pined away and died. The gods in compassion then changed him into this lovely flower that grows near quiet pools.

There are several species of the narcissus, including the daffodils and jonquils. The poet’s narcissus (*Narcissus poeticus*) is celebrated in Greek and Roman verse. The trumpet narcissus (*Narcissus pseudo-narcissus*) is the common English daffodil. *Narcissus polyanthus* is the parent of the cultivated varieties

which are grown so extensively by florists and treasured as garden flowers in all parts of the world.

The paper white narcissus is so sturdy that it can be grown in winter in our living-rooms. The bulbs

NARCISSUS IN BLOOM



Imagine yourself in the Alps in spring and the meadows covered with flowers like these!

should be set in a deep bowl, surrounded with stones to keep them in place, and kept well covered with water. They should be placed in a dark, cool place until the heavy mat of roots has formed and the leaves have started. They then want plenty of sunlight, but not too much heat, and if kept in a temperature of from 60 to 65 degrees will bloom delightfully.

Narcissus tazetta is the scientific name of the ordinary paper white narcissus. Flowers white, 1 to 1½ inches across,

growing in clusters of 4 to 13 at the top of a tall, round scape; perianth tube about 1 inch long, broadening into 6 segments; tiny corona, crinkled and scalloped at the throat of the tube; 6 stamens, 3 near throat, 3 lower; leaves narrow, growing 1 to 2 feet high; bulb about 2 inches across.

NARCOTICS. Certain substances, derived mainly from plants and known as narcotics, have for ages interested mankind because of their strange and powerful effects upon the nervous system. Few drugs are more valuable than these when properly used by medical men; yet, misused by drug addicts, none have caused so much suffering, crime, and degradation. This non-medical use, and the illicit traffic catering to it, has long been so destructive that national and international legislation has been aimed against it.

Narcotics are used in medicine to abolish pain (*anodynes*), to produce profound sleep (*hypnotics*), or as remedies for certain diseases. The effect produced depends largely on the dose, poisonous amounts causing stupor, complete unconsciousness, paralysis, and even death. Most narcotics, even in slight doses, are dangerously habit-forming, and lead to a craving for ever-increasing amounts. Prolonged or excessive use destroys both mind and body.

The typical narcotics are opium and its derivatives, of which morphine is considered indispensable to medicine (*see* Opium). The other opiates, laudanum, heroin, and codein, are also valuable. The smoking of opium was once its most common abuse, but now the manufactured derivatives, morphine and heroin, and the drug cocaine, claim more victims outside the oriental countries where opium still dominates.

Cocaine is derived from the dried leaves of the coca shrub (*Erythroxylon coca*), grown in South America. Great good and great evil are combined in its shining white crystals. Cocaine users are among the most pathetic and numerous of all drug addicts, while the dentist and doctor find the drug highly beneficial as a local anesthetic. Synthetic drugs now are replacing cocaine for this purpose. General anesthetics such as ether and chloroform are sometimes classed as narcotics (*see* Anesthetics). Other common narcotics are belladonna, made from the nightshade plant; stramonium, from the thorn apple; and hyoscyamus, from the henbane plant. (*See* Poisonous Plants; Poisons.)

Flowers of hemp (*Cannabis indica*), grown in the Orient, furnish the resinous substance hashish, which is smoked, chewed, or used in a drink. Hashish is wildly intoxicating and injurious; it has little medical value (*see* Assassins; Hemp). A Mexican hemp furnishes the similar drug marihuana, which is smoked.

Barbituric acid, a complex synthetic substance formed from malonic acid and urea, is combined with various organic radicals to make sedative drugs such as barbitol (veronal), trional, luminal, sodium luminal, allonal, and dial. Sulfonal or sulphonol (HSO_2CH_3) and its derivatives form similar drugs. Continued doses may lead to addiction. Chloral, a synthetic hypnotic ("knockout drops"), is habit-forming and harmful. It is little used in medicine.

In an attempt to suppress drug addiction by limiting manufacture to the amount needed in science and medicine, the League of Nations in 1931 invited all nations to enter into a Narcotics Limitation Convention. On April 10, 1933, the required number of signatures brought this Convention into effect. The drug-manufacturing nations included were France, Germany, Great Britain, Turkey, and the United States. In the United States, importation and sale of narcotics have been regulated since 1914 by a Federal Bureau of Narcotics under the Harrison Anti-Narcotic Act. The Federal government maintains hospitals for the treatment of drug addicts at Lexington, Ky., and Fort Worth, Tex.

The term "narcotic drugs" in legislation means crude opium, coca leaves, and their derivatives and preparations. Alcohol in large amounts has a narcotic effect. In many states schools are required to give instruction about the harmful effects of narcotics, alcohol, and tobacco. Literature advising against the use of tobacco is dispensed by the Anti-Cigarette League. (*See* Alcohol; Tobacco.)

NASHVILLE, TENN. On New Year's Day, 1780, a few pioneers led by Gen. James Robertson settled on the Cumberland River in middle Tennessee and built Fort Nashborough. The settlement became the town of Nashville in 1784. Its position in a vast, fertile valley with varied resources soon made it Tennessee's second largest city. It has been the state capital since 1843.

Nashville is perhaps proudest of its reputation as "the Athens of the South," won because of its many educational institutions. Among these are Vanderbilt University; George Peabody College for Teachers;

Scarritt College for Christian Workers; Ward-Belmont Junior College; and, for Negroes, Meharry Medical College, the Tennessee Agricultural and Industrial State Teachers College, and Fisk University, made famous by the Fisk Jubilee Singers.

In "the Athens of the South," Greek architecture has been employed for most public buildings. Among these are the State Capitol, inspired by the Erechtheum; the Doric War Memorial; the State Office Building; the State Supreme Court Building; and a reproduction of the Parthenon. On the capitol grounds is the tomb of President James K. Polk.

Nashville's annual Iris Festival attracts a host of visitors. Percy Warner Park has 25 acres of iris in its five square miles of wooded hills. The Municipal Iris Gardens of Shelby Park contain some 500 varieties.

A reproduction of Fort Nashborough stands on the Cumberland River in the modern business district. Here, in April 1780, James Robertson and his companions received their families, who had come in boats via the Tennessee, Ohio, and Cumberland rivers from the Watauga settlements farther east, under the leadership of Col. John Donelson. The name of the fort, like that of the city, honors Gen. Francis Nash of the American Revolution. Andrew Jackson's plantation home, built in 1835 and called "The Hermitage," is preserved as a museum 12 miles east of Nashville.

At Franklin, 17 miles south of Nashville, a national cemetery marks the field where Union forces checked Hood's advance Nov. 30, 1864. Another marks the site of the battle of Nashville Dec. 15-16, 1864, in which General Thomas ended all Confederate resistance in the west. The Union Fort Negley, outside the city, has been restored.

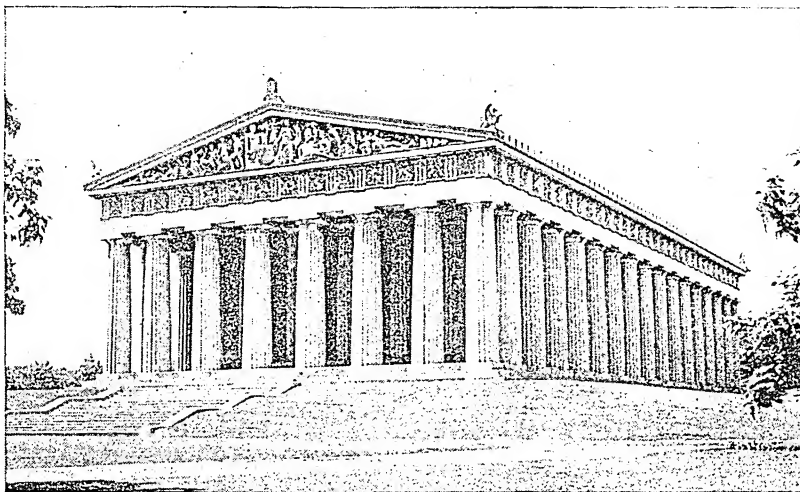
Transportation and Industries

Nashville is the market center for the rich middle Tennessee farming area. It is served by three railroad lines, eight United States highways, a nine-foot river channel for barges, and a large airport.

The highly diversified industries are led by rayon and cellophane manufacture, and by printing and publishing, especially of religious periodicals and books. Other products are clinical thermometers; steel barges and various small craft; airplanes; stoves, heaters, and ranges; work shirts and other apparel; and chemical products, including fertilizers and insulation materials. Population (1940 census), 167,402.

NASTURTIUM. The name nasturtium comes from two Latin words, *nasus* and *tortus*. They mean "nose" and "twisted," and together they suggest the pungent fragrance of the flower. The shield-shaped leaves and

"THE GLORY OF ATHENS" LIVES AGAIN IN NASHVILLE



Twenty-three centuries ago the Athenians felt a thrill of pride whenever they looked at the hill in the center of their city and saw the glorious beauty of their leading temple, the Parthenon. Today this faithful reproduction of the Parthenon graces the driveway circling Centennial Park in Nashville, the "Athens of the South."

helmet-like blossoms suggested the scientific name *Tropaeolum*, from a Greek word meaning "trophy."

The yellow, orange, or red flowers bloom singly on climbing or creeping stems, from early summer until the first frost. The plant is a native of South America, and it was introduced into Spain, France, and England in the 16th century. One species produces underground tubers, which South Americans boil and eat like potatoes. Flower buds and young seeds are sometimes pickled and used for seasoning; the English use the leaves as "Indian cress" in salads.

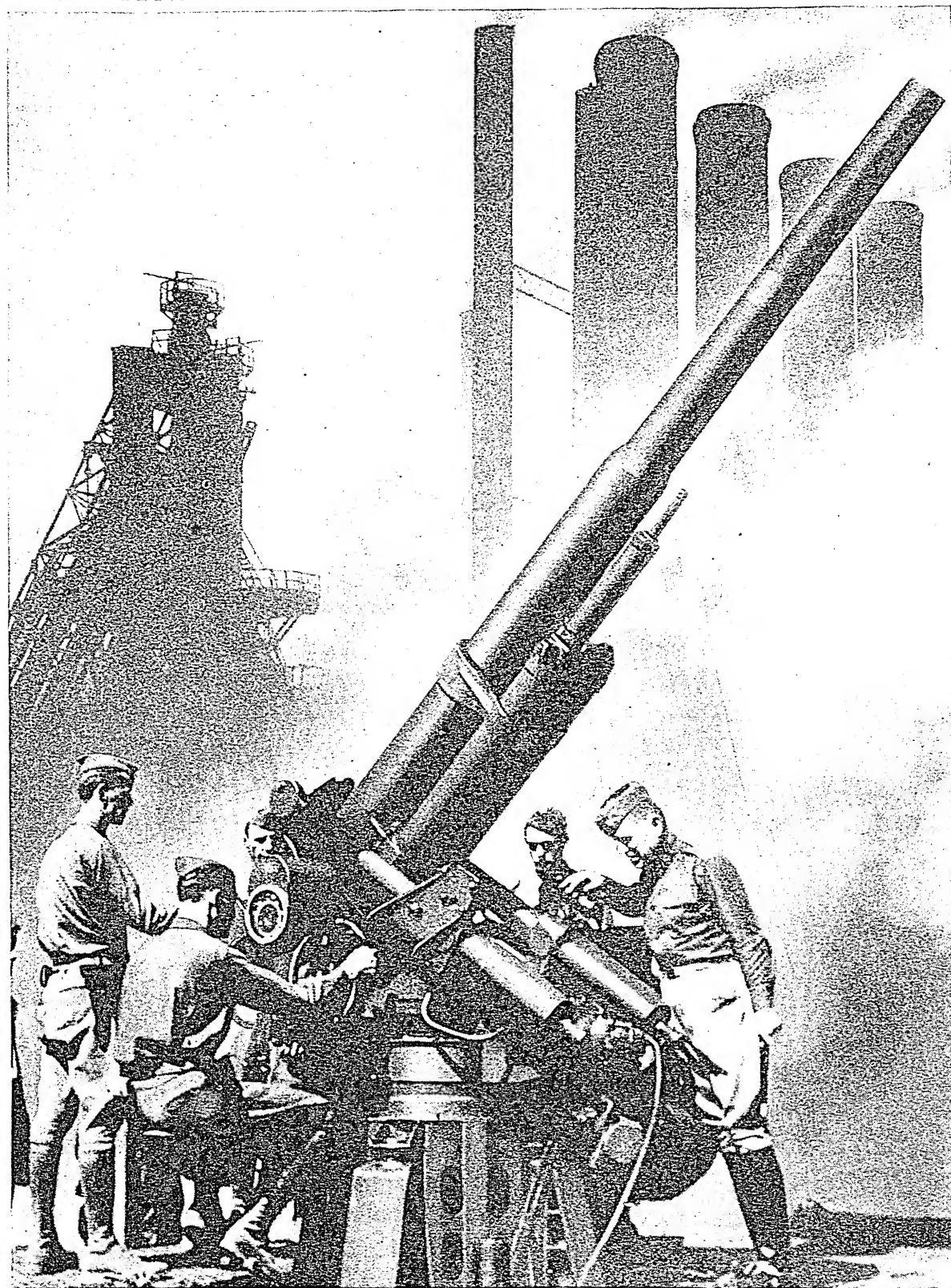
Botanists call the water cress *Nasturtium officinale*, but it is not related to the nasturtium. There are about 20 species of nasturtiums. The best known are *Tropaeolum majus* and *Tropaeolum minus*, meaning "larger" and "smaller" *Tropaeolum*.

NATAL (*nā-tāl'*), SOUTH AFRICA. The "Garden Province" of the Union of South Africa is on the southeast coast, facing the Indian Ocean. The coastal strip is subtropical and grows sugar for export. Citrus fruits, tea, tobacco, and cotton are also grown.

Back of the coast the province rises sharply to its western boundary in the Drakensberg ("Dragon's Mountains"), whose 10,000-foot peaks are the highest in South Africa. The somewhat dry, temperate climate of this region is fine for corn, dairy farms, and beef cattle. Mining timbers and a tanning extract are obtained from the wattle, a species of acacia.

Natal is rich in minerals, and it exports coal and manganese. Durban (population, about 260,000) is an important coaling station and the leading port. It serves the import and export trade of Rhodesia and of the gold mines of the Witwatersrand. Near by is the capital, Pietermaritzburg (population, about 50,000). The name Natal means "birthday." It was bestowed by Vasco da Gama who discovered the region on Christmas Day, 1497. Population, about 2,000,000, including 200,000 of European descent.

BEHIND THE GUNS STAND THE FACTORIES



The Nation at War means an unbroken line of coöperation from the farm and the mine, the factory and the railroad, the office and the laboratory, to the battlefields and sea lanes that girdle the earth. It means a unity of purpose joining in invincible combination the citizen soldier and the citizen worker.

The STORY of a NATION at WAR



A Honolulu schoolhouse goes up in flames after it was bombed by Japanese planes Dec. 7, 1941. The bombs that fell on unsuspecting Americans that day set on foot in the United States the greatest war program in the world's history

NATION AT WAR. The Japanese attack on Pearl Harbor Dec. 7, 1941, found the United States about one-third mobilized for war. The fighting spirit of the people, their eagerness to strike back and win a decisive victory at all costs exceeded the weapons at their command.

Modern warfare is more than the 600-mile-an-hour dive of the fighter plane, the clanging charge of monstrous tanks, the bouncing dash of the torpedo boat, the thunderous roar of artillery. True, all this is swift, bold action that fits the American temper. But it is just the "glamorous" veneer of war; underneath is the homely, unglorified side—the production of the implements of war. The manufacture of planes, guns, tanks, and ships; the construction of munitions and aircraft plants; the training of millions of soldiers; the reorganization of industry, transportation, and all civilian life—these are the vital ingredients of warfare in which the United States was only one-third ready.

Elsewhere is told the story of heroism at Wake Island, Bataan, and Corregidor; of the victories in the Coral and Bismarck seas, at Midway, in Tunisia, the Aleutians, and Sicily. Here we tell how the nation at home faced the test of patience and faith, and how it went about the huge task of catching up with the war and forging the weapons of ultimate victory.

Strength to Meet the Challenge of War

There was need for faith and patience. Germany in ten years had armed and drilled its people for lightning conquest, and had already captured virtually all the

resources of continental Europe. Japan had been perfecting its war machine for 25 years. Russia had been beaten back to its last lines of resistance before Leningrad, Moscow, and the Caucasus oil fields. Most of the British Empire's resources were concentrated on defensive action in Great Britain and in the Mediterranean. The alignment of Germany, Italy, and Japan might well produce an Axis victory in Europe, Africa, and Asia unless the United States brought tremendous strength to bear within a few months.

Against all this the Americans knew they had the necessary power to crush the Axis provided they could organize their power swiftly enough. The foundation of that power was Materials, Machines, Money, and Manpower.

The United States possessed an enormous share of these all-important four M's. It had most of the raw materials needed for war and produced as much industrial material as the rest of the world together. The nation likewise led the world in the development and use of machines. A war of machines seemed made to order for American mechanical and industrial genius.

Whatever money could do to win the war would be done. For even its enemies admitted that the United States was the richest country in the world, with unlimited credit and a national income rising above 100 billions a year. But even greater than the faith in Materials, Machines, and Money was the nation's supreme confidence in its Manpower. American soldiers and sailors had always proved the equal of any in the world. American workmen had the spirit, the skill,

and the adaptability to outproduce any and all rivals. And the American people as a whole were imbued with a tradition of making the impossible come true.

In short, the United States stood at the brink of war confident that its resources would bring it a long-run, if not a quick, triumph.

How the Nation "Geared Up" for Wartime Demands

AMERICAN PREPARATION for war dates back to the beginning of 1939. Then the question of national defense was uppermost.

The old policy of limiting armaments, pursued since the end of the first World War, was discarded. Measures were passed to increase the Army and Navy, to strengthen fortifications, and to accumulate stocks of strategic materials. Nearly two billion dollars was devoted to these purposes.

The outbreak of war in 1939 and Germany's subsequent victories spurred the nation's rearmament program and its decision to help the enemies of the Axis by making the United States the "arsenal of democracy." Then in March the Lend-Lease Act gave the President the right to provide arms and supplies to any country whose defense he deemed vital to the defense of the United States.

Materials and Machines

When Japan attacked Pearl Harbor, what were the nation's prospects? In the fall of 1941 the United States was producing great quantities of essential war materials: petroleum, iron and steel, copper, coal, zinc, and lead. Other supplies of these and additional vital materials, such as bauxite (for aluminum production), nickel, chromium, tungsten, and manganese, were available from friendly nations. But there were serious gaps—chiefly tin and rubber, both imported from the Far East and likely to be cut off by war in the Pacific. The country had reserve stocks of these materials sufficient to meet war needs for a year or so, and the government took control of imports, stocks, and uses of these and other essential materials. Strict priorities governing their use for military and civilian production were set up.

Of food there was more than enough for the United States, and the nation's six million farms could expand their production to supply what its allies lacked, should ships be available to transport the food. Shortages might develop in particular kinds of food, such as sugar, tea, coffee, and tropical fruits; but hunger would not become a trial of war.

What of the machines of war? Often the actual production of war materials had to wait until new factories could be built and equipped. Between June 1940 and December 1941 seven billion dollars was spent in this way. This amounted to a 31 per cent increase in the nation's manufacturing facilities, five-sixths of it financed by the government. Most of the plant expansion was carried out in the following fields: chemicals (including explosives), ammunition (shells, bombs, etc.), aircraft and aircraft engines, ship construction, iron and steel, guns, and machinery.

"Bottlenecks," or shortages and delays, plagued war production. Certain war materials were controlled by international monopolies (cartels) that limited the supply available to American industries; but gradually the government broke up this control and by the end of 1941 most of the products affected were free from restrictions.

The greatest bottleneck was in the supply of machine tools: lathes, drills, and other power-driven tools. From the beginning of 1940 to the end of 1941, however, the machine-tool industry doubled its production capacity. Similarly the problem of plant location, though knotty at first, was gradually ironed out until by the fall of 1941 new plants were being built in locations better suited to the government's requirements of efficiency, economy, and military safety from bombing attack.

When war began in 1939 there had been a shortage of merchant ships that produced a critical shipping problem. As 1941 closed, the merchant-ship construction program had delivered during the year more than a million gross tons of new shipping, nearly double the tonnage built in 1940 but still far short of needs.

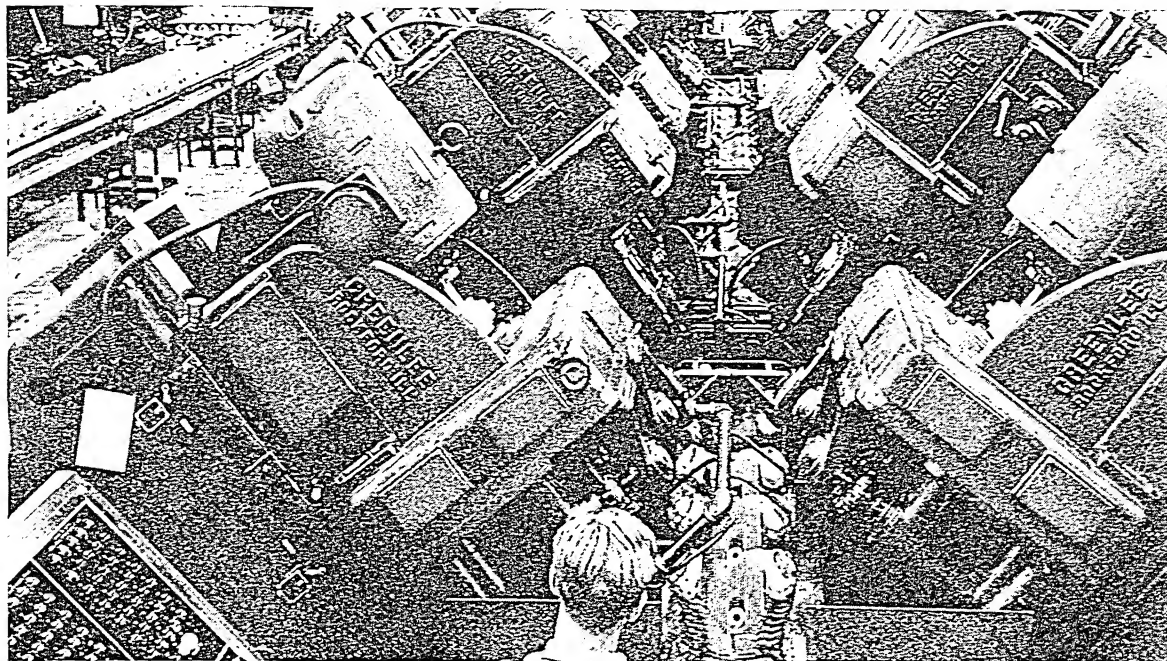
Money and Manpower

In 1938, when Germany was spending at the rate of 10 billion dollars a year preparing for war, the United States appropriated for military purposes a little more than a billion dollars. There was a fair increase in 1939 and again in the first appropriations of 1940. But beginning in June of that year, appropriations for defense soared at a rate never before approached in the history of any nation.

During the ten days that marked the fall of France, more than 5 billion dollars was appropriated. And by Dec. 7, 1941, the accumulated total of defense appropriations reached 64 billions. This included 7 billions of lend-lease funds.

Turning to the manpower situation, "total" mobilization in the United States—a requirement of modern "total" war—had barely started by the time war struck; the nation had been divided on the question of whether it would engage in aggressive war. The draft law of 1940 had expanded the Army from 230,000 enlisted men to 1,588,500—and most of these had been seasoned with field training. The recruiting of pilots for the Air Force had jumped from 7,000 to 12,000 a year. The Navy had been expanded from 177,000 men on June 15, 1940, to 277,000 men; the Marine Corps, from 42,000 to 83,000. Employment in manufacturing industries had increased from 8 million in June 1940 to nearly 13 million in November 1941. Most of this increase was in war production. The expansion, for which funds had already been authorized, called for the employment of 3 million more within the next year.

All the preparations and changes so far described still left the nation only one-third mobilized for war. Now let us see how the people of the United States went about the other two-thirds of their task.



America entered the war possessing a decisive weapon—the industrial ingenuity that produced the amazingly efficient machine shown here. The workman at the control board in the foreground is tooling cylinder heads of Wright Cyclone airplane engines. The machine handles over 100 cylinder heads simultaneously and cuts the time of operation from 300 manhours to 47 seconds.

The Gigantic Upsurge Started by Japan's Attack

IF THE Japanese attacks on December 7 had struck Los Angeles or San Francisco, the effect could not have been more electrifying. The entire nation stiffened like soldiers do when the bugle sounds "Attention!" The first thought was, "We're in the war, at last! What can we do now to win it?"

The shock produced by the stunning news gave way the next day to outward calm. But beneath the surface surged tremendous activity. Railway passengers caught a glimpse of it when their cars were shunted to sidings while troop trains and even grimy freights loaded with guns or tanks roared by. Along many highways near the coasts, artillery and brown army trucks rolled forward day and night in endless streams. In the seaports, transports which had been lying idle at sunset had vanished into the unknown by sunrise. In all, some 600,000 troops were moved within three weeks to battle stations at home and abroad; but so smoothly was it all done that the civilian traffic of the holiday season was scarcely interrupted.

The first important clues to the changes that actual participation in the war was going to bring to the American people came out of Washington. During the last days of December, Prime Minister Churchill had come from England to discuss the grand strategy of the war. On January 2-3, after a series of conferences, the pact of the United Nations had been signed by representatives of the 26 countries fighting the Axis.

Organizing the Government for the War Effort

When the President spoke to Congress on January 6, some results of the new planning were disclosed and

all previous estimates of American war production were swept away as he outlined the following stupendous program:

PLANES: 60,000 in 1942; 125,000 more in 1943.

TANKS: 45,000 in 1942; 75,000 in 1943.

ANTI-AIRCRAFT GUNS: 20,000 in 1942; 35,000 in 1943.

MERCHANT SHIPS: 8 million tons in 1942; 12 million tons in 1943 (later raised to 16 million tons).

"The superiority of the United Nations in munitions and ships must be overwhelming," said the President, "so overwhelming that the Axis nations can never hope to catch up with it. To attain this superiority the United States must build planes and tanks and guns and ships to the utmost limits of our national capacity. We have the ability and the capacity to produce arms not only for our own forces, but also for the armies, navies, and air forces fighting on our side. . . .

"This production of ours in the United States must be raised far above present levels, even though it will mean the dislocation of the lives and occupations of millions of our people."

The Leading Government War Agencies

Thereafter changes within the government came rapidly. Within a short time it became apparent that the most vitally important parts of the work would be entrusted to six agencies:

The War Production Board (WPB), entrusted with providing the weapons, equipment, and supplies for war.

The United States Maritime Commission (USMC), entrusted with providing merchant shipping needed.

The Office of Defense Transportation (ODT), to control all transportation except ocean shipping.

The War Manpower Commission (WMC), to provide manpower as needed for every civilian effort.

The Office of Price Administration (OPA), to keep rents and prices of civilian goods at fair levels, to assist in con-

trolling prices of war materials, to prevent inflation and ruinous changes in prices after the war.

The Office of Economic Warfare (OEW), to provide helpful exchanges of goods with foreign countries, to block Axis sources of supply, and to prepare plans for national and international economic life after the war.

Various other organizations were established to perform special functions. Among them were the Office of Civilian Defense, to protect civilians in case of attack; the Office of Censorship, to withhold information from the enemy; the Office of War Information, to foster public understanding of the war effort; the National War Labor Board, to deal with disputes in war industries; the Solid Fuels Administration for War, to direct the saving and effective use of coal; the War Food Administration, to control the production and distribution of food; and the Office of Lend-Lease Administration, to control the supply of war goods to allied nations under terms of the Lend-Lease Act.

As an overall "contact organization" the President had established the Office for Emergency Management (OEM), and many of the war agencies were organized by executive order as part of this office. Other bureaus created by Congress were required by executive order to furnish information and confer about their work with the OEM. Finally, behind all these agencies stood the Department of the Treasury, charged with the heavy burden of financing the war.

The government also undertook to provide more men for the Army. Twelve days after Pearl Harbor, Congress revised the Selective Service Act of 1940 to require the registration of all men from 18 to 64 years of age inclusive. About 19 million of these—from 21 to 35—had already registered. Among the new registrants were about 9 million more of combat age (over 19 and less than 45). From this total of 28 million, the Army estimated it could recruit if necessary about 7 million soldiers. The other registrants, below and above combat age, could replace fighting men in the essential jobs of industry. The Navy in turn proposed a 30 per cent increase in the strength of its fighting personnel.

But huge increases in the fighting forces could not be made until the Army and the Navy had the means to train, equip, and transport their recruits. The first problem of 1942 was still the production of equipment and supplies.

Swift Rise of War Production

THE NEW, intensified program of war production started on January 16. On that day the President created the War Production Board, with Donald Marr Nelson of Chicago as chairman. This board re-

placed or dominated all the older agencies in charge of war production and was given sweeping new powers.

Nelson's responsibilities were enormous. Besides meeting American needs, he had to provide supplies for other countries. Both the Board of Economic Warfare and the Lend-Lease Administration could call upon him for the goods and materials they needed to carry out their obligations. He had to plan production as best he could to meet these demands.

Allocations and Priorities

To determine how and where materials should be used, Nelson and the WPB applied two devices, allocations and priorities. *Allocations* assigned scarce materials and tools to certain industries. *Priorities* named the order in which individual plants or operations within an industry could get the allocated material.

Many people had believed that war production could be developed gradually, to reach its apex in 1943. But Japan's rapid successes and the losses of merchant ships in the Atlantic quickly shattered this belief. Soon everyone realized that one ship, or gun, or tank, or airplane produced in 1942 would be worth three or four produced in 1943.

Program of Industry Conversion

On Feb. 8, 1942, Nelson told the nation in a radio address that the fastest road to victory would be the *conversion* of existing industrial plants; that there was not enough material, manpower, or time to build the country's war industries from the ground up.

The most outstanding example of conversion took place in the giant automobile industry. It started even before the manufacture of automobiles for civilian use was halted February 1. Half of the old equipment had to be discarded entirely, and half of what remained had to be rebuilt. America's first great victory was won in the Detroit sector in January and February when the automobile industry tore itself apart and put itself together again, completing the job two months sooner than anyone had believed possible. Hundreds of other industries were converted almost overnight from peacetime to wartime production.

Never did American productive genius have a better chance to prove itself than now. Manufacturers cut 25 per cent of the time which the Army had estimated

was necessary to make machine guns. They reduced the time for cutting out the bore of an antiaircraft gun from 3½ hours to 15 minutes. They devised a machine that made 12 tank engine sprockets in 6 minutes where formerly the shaping of a single sprocket had taken 8 hours of labor.

As part of the drive to bring more and more materials, factory equipment, and workers into war pro-

CIVILIAN & WAR OUTPUT of U. S. Industries

1941

CIVILIAN

WAR
21%

1943

CIVIL-
IAN

WAR
70%

This graph shows how the proportion between production for war and production for civilian use changed from 1941 to 1943.

duction, WPB placed constantly growing restrictions on production for civilian use, particularly of such things as radios, refrigerators, vacuum cleaners, electric appliances, and other metal-consuming products. The effects of many of these prohibitions reached the public only gradually, as the stocks on hand became exhausted.

Production Rises Rapidly

The drastic reorganization of American industry quickly bore fruit. By March 1942 Nelson was able to announce that airplane production had already risen more than 50 per cent since Pearl Harbor, and this was before the plants in Detroit and elsewhere in the Middle West had reached the stage of mass production. By summer, planes were being produced at the rate of 4,000 a month.

The work of existing plants was rapidly supplemented by that of the newly constructed plants which were getting into production every week. The construction industry, almost entirely converted to military and other essential building, had on hand in 1942 the largest building program in the nation's history—\$13,750,000,000. This was one-fifth larger than the previous all-time record established in 1941.

To make this gigantic building program possible WPB on April 9 had halted virtually all civilian construction, whether publicly or privately financed, and had given notice that no further construction would be permitted unless specifically authorized. By 1943 most of the new war plants had been completed and the resources of the building industry were transferred to war production.

Swift Consumption of Raw Materials

As the manufacture of war equipment began to draw ahead of schedule, it became difficult to keep the workers supplied with some of the raw materials which they were using up so rapidly. The rubber problem was the most acute. By March 1942 East Indian shipments had been entirely cut off by the Japanese advance. The only way to replace them quickly and in large enough quantities was by pushing the manufacture of synthetic rubbers (see Rubber). After numerous technical and administrative delays a committee appointed by the President recommended a program that would yield 516,000 tons of synthetic rubber during 1943 and over a million tons a year after that. The committee suggested a national automobile speed limit of 35 miles an hour and nation-wide gas rationing to con-

HOW CRITICAL MATERIALS ARE SAVED FOR WAR

Bicycles—By manufacturing only one model, by stripping this model of excess weight, and by sharply limiting production, the industry saves 30,000 tons of steel—enough to make 800 medium tanks.

Lead Pencils—By eliminating clips and tips, enough brass is saved to make cartridge cases for more than 18,000,000 rounds of rifle ammunition.

Telephones—Replacing aluminum with steel in dial telephones saves 1,700,000 pounds of aluminum—enough for 450 fighter planes; coating pole lines with lead instead of zinc saves more than 3,000,000 pounds of zinc for galvanizing shipware.

Refrigerators—Manufacture for civilian use ended April 30, 1942. Materials consumed in one year provide enough steel for 7,000 light tanks, or 5,000 medium tanks, or about 1,500,000 heavy machine guns; enough aluminum for 900 heavy bombers; enough rubber for 4,000,000 army raincoats and 1,000,000 gas masks.

Radios—Manufacture of sets for civilian use ended April 23, 1942. Materials consumed in one year provide aluminum for 1,300 fighter planes, steel for 2,000 medium tanks, nickel for 25,000 tons of nickel steel for armor plate, rubber for 9,000 army trucks, copper and zinc to make brass for 150 million machine-gun cartridges.

serve tires already in use. On September 15 William M. Jeffers was appointed "rubber czar" to supervise the program (see later section on "Rationing").

The Production of War Metals

Aluminum, once the most pressing problem, was now plentiful. Production was four times greater by the end of 1942 than previously, and the United States and Canada could turn out 2½ billion pounds a year—almost twice the total world production in 1939. Chromium was also no longer a problem. The development of chromite

mines in Montana had made the United States the world's largest producer. Tin and copper were still short, but there was more than enough silver.

To keep pace with steel requirements, additional mills were needed. But here was a true dilemma. To construct the mills with their equipment and transportation facilities would itself consume vast amounts of steel. The net effect would be to diminish for the time being rather than to increase the supply available for ships, tanks, and guns. To escape this dilemma, the government continued to squeeze the civilian use of steel down to the barest essentials.

The producing capacity of existing steel mills was limited by a shortage of the steel scrap which is used with pig iron in making new steel. Hand in hand, therefore, with the efforts to conserve critical materials went the campaign to search out, collect, and use the nation's steel scrap on a scale never before attempted. Rubber, brass, and copper scrap were also important. Citizens were asked to ransack their cellars and attics for discarded articles made of these materials. Owners of automobile "graveyards" were called upon to sell their old car bodies, frames, and wrecked engines to junk dealers.

The Bottleneck of Transportation

AT THE other end of the production line—the point where equipment was ready for delivery—the upsurge in production created a new bottleneck. Transportation became inadequate. By the spring of 1942 the nation began to realize that it might not be able to move its output fast enough to make the most of its military opportunities. This turned into one of the greatest problems of the war. But the American railroads met the challenge superbly.

At the time of the Pearl Harbor attack, the railroads had been moving an average of 900,000 tons of freight

one mile for every minute of the day—an all-time record. Within three weeks they moved 600,000 troops to battle stations, and by April 1943, 1,750,000 troops were traveling on trains in official troop movements. About half the number of Pullman cars and 17 per cent of all day coaches were in troop use. Yet all this troop-passenger movement did not slow up the movement of freight. In 1942 the railroads carried 683 billion ton miles of freight. This was an increase of one-third over the tonnage hauled during 1941, the previous peak year. This efficient freight movement was in sharp contrast to the delays that plagued the country during the first World War.

Other Inland Transportation

Backing up the railroads came the trucks. Five million of them were at work on short hauls, one and a half million on the farms, and one-half million on long hauls linking 50,000 American communities not served by rail. Behind the trucks were 21,000 boats and barges on the Mississippi, the Ohio, the Missouri, and the other river systems and the canals, carrying oil, scrap, sulphur, and grain. There were 300 ore boats that in 1941 moved 80 million tons of iron ore over the Great Lakes. This movement was increased to 92 million tons in 1942. There were also 130,000 miles of oil pipe lines.

But the rubber shortage threatened truck traffic, and raids by Axis submarines on the coastwise shipping that supplied the Atlantic seaboard threw a greater burden on railroads, pipe lines, and inland waterways.

Land Transportation Unified

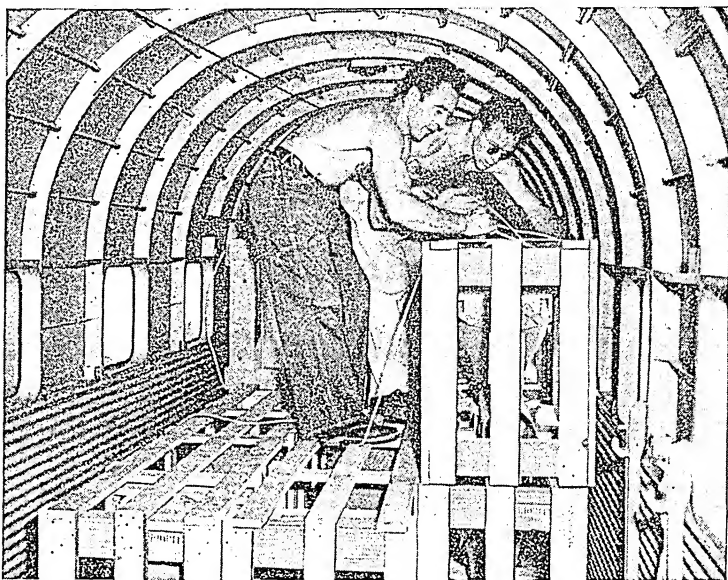
Wartime control of all these problems began Dec. 23, 1941. On that day the President named the chairman of the Interstate Commerce Commission, Joseph B. Eastman, as director of the Office of Defense Transportation (ODT). Eastman's first duties were to coordinate railroad, truck, waterway, pipe-line, and air transportation throughout the nation.

These powers were enlarged by an executive order effective May 4, 1942. In this order the President gave Eastman power over all privately owned and operated motor transportation, including all passenger automobiles. In fact, the order covered "all rubber-borne transportation facilities." Other government agencies were directed to cooperate with Eastman in regulating the use of automobiles and trucks, curtailing gasoline, and similar measures.

A New Era of Air Traffic

On May 14, 1942, the War Department took over the direction of all the commercial air lines in the United States. Many of the passenger planes were immediately converted into freight carriers to handle emergency shipments. Civilian travel on the remain-

INSIDE A FLYING FREIGHT CAR



The magic words "Priority Air Transport" stamped on these crates give them reserved seats aboard this plane. The loading crew is lashing them down securely for their swift voyage. Only war materials or machine parts urgently needed at distant points travel in this way.

ing planes was strictly limited. In June the Air Transport Command (ATC) was set up under Gen. Harold Lee George. It combined the Army Ferrying Command and the Air Service Command, and had as an auxiliary the world-wide network of American-owned air lines. To the many transport planes already manned and managed by these air lines, the Army by the end of 1942 had added 300 new cargo carriers and scores of big bombers made obsolete by later designs. Day and night these planes crisscrossed continents and oceans. War supplies were carried to remote outposts in Alaska and across the Himalaya Mountains to China. Altogether, the military and civilian branches of this system created a new era in the history of air traffic.

The Greatest Need of All—Ships

The President's program of January 6 had called for 8 million tons of merchant ships in 1942 and 16 million tons in 1943. This was the minimum that would maintain the flow of supplies to Great Britain, Russia, and other friendly nations and also carry American forces and their equipment to the scenes of action. The program under the direction of the United States Maritime Commission called for steel amounting to almost a tenth of the nation's total productive capacity. This vast mountain of steel had to be worked into intricate shapes, transported to shipyards, and there assembled into finished vessels by highly skilled craftsmen.

American ingenuity went to work on this problem with astonishing results. Men who had never built ships before set up shipyards and invented new methods of construction. The time of building a standard freighter was cut from more than 100 days to less than 25. By September 1943 an average of five new cargo ships a day was reached.

Mobilizing the Nation's Full Man- power

As THE tools and weapons and ships grew in number, so also grew the need of men to handle them. In the end the war would have to be won by the entire manpower of the nation and the woman-power as well. Each person would have to do his or her part where it would count most.

Many Men Needed

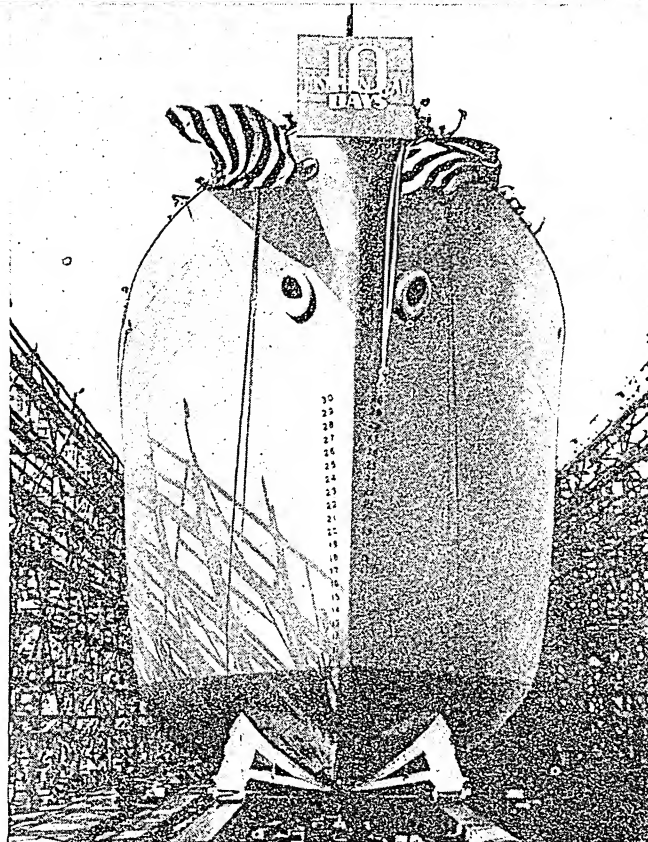
The magnitude of the manpower problem became apparent when the government began to compute the requirements of the armed services, of industry, and of agriculture. The United States contemplated an army of about 11 million men by 1944; war industries needed about 12 million workers; essential civilian industries and services, about 30 million; and 12 million workers had to stay on the farms. In other words, 65 million persons were needed to wage total war and carry on activities essential to the national life. But the total of all males from 18 to 64 years, inclusive, who were now registered under the Selective Service Act, was only some 42 million, including the unfit. The problem could be met only by tremendous increases in the number of women workers.

Filling the Army's Requirements

On the shoulders of Maj. Gen. Lewis B. Hershey, director of Selective Service, rested the responsibility of producing the stipulated number of men for military service. In the first two drafts before Pearl Harbor, local draft boards had deferred 64 per cent of the registrants because of dependents, and had been generous in deferring men employed in key positions in business and industry. The Army, in turn, held its physical standards so high that of the men called up for examination 40 per cent were rejected. But after Pearl Harbor, the draft age was extended to include men between the ages of 20 and 45, and the interpretation of the Selective Service regulations was drastically revised.

Men with minor physical defects and men with dependents were reclassified and called as soon as the higher classifications were exhausted. Only two basic reasons for permanent deferment from military service were now recognized, namely, that the man in question had to be physically disabled or had to be irreplaceable in a job essential to the national welfare. The drafting of men with dependents became prac-

A MIRACLE OF SHIP CONSTRUCTION



The top picture shows the laying of the keel of a 10,500-ton Liberty freighter at a shipyard in Portland, Ore. The lower picture shows the launching of the ship ten days later. Four days after the launching, the ship had been completely outfitted, and on the fifteenth day after the keel was laid the ship started with a full war cargo on its first voyage. This miracle of speed was achieved by Henry J. Kaiser's Oregon Shipbuilding Corporation, as a special feat to show the extreme possibilities of the new methods of construction developed by Henry Kaiser, in which a ship is put together from prefabricated parts.

tical when Congress in June 1942 increased Army pay and set up special allowances. The base pay of enlisted men was raised from \$21 a month to \$50, and a basic allowance of \$28 a month was provided for their wives, with further allowances for their children and other dependents.

To increase further the number of men available for military service, the War Department raised the age for voluntary enlistments to 50 years and Congress, at the President's request, gave the draft boards the power to induct boys of 18 and 19 years of age for combat service.

Women as Aids to the Armed Forces

The following organizations of women were formed to release as many men as possible for combat duty:

Women's Army Corps (WAC)—originally *Women's Army Auxiliary Corps*—created May 14, 1942, with Mrs. Oveta Culp Hobby as director. It undertook to train a corps of volunteers between the ages of 21 and 45 to replace men in noncombatant capacities anywhere in the world.

Women Accepted for Volunteer Emergency Service (WAVES), a corps created July 30, 1942, under the directorship of Miss Mildred H. McAfee, to train women for duty in shore establishments of the Navy.

Women's Auxiliary Ferrying Squadron (WAFS), created Sept. 10, 1942, commanded by Mrs. Nancy Harkness Love, to ferry training and messenger planes from factories to airbases. Its members retained their civilian status.

Women's Auxiliary Reserve, Coast Guard (SPARS), commanded by Miss Dorothy Stratton, established Nov. 23, 1942, to train women for shore posts with the Coast Guard.

Women's Reserve, U. S. Marine Corps, organized Feb. 15, 1943, with Mrs. Ruth Cheney Streeter as director, to train women to replace men in shore posts.

Regulating Civilian Manpower

The armed forces and expanding war industries were taking men from factories, farms, and mines. The War Manpower Commission, with Paul V. McNutt as chairman, was charged with coordinating the conflicting demands on manpower and "rationing" it very much as materials were rationed.

On Oct. 12, 1942, President Roosevelt outlined the government's civilian manpower program. Its main objectives were these:

To make sure that both war industries and farms have all the workers they need to produce the arms, munitions, and food required by the United States and its allies.

To stop workers from moving from one war job to another as a matter of personal preference, and to stop employers from hiring men away from one another.

To train new personnel for essential war work and to stop the wastage of labor in all nonessential activities.

To use older men, handicapped people, and grown boys and girls to replace men of military age and fitness.

To make it possible for high school students to take time from their school year and to use their vacations to help on farms and in war industries.

All these objectives, said the President, must be achieved—by voluntary cooperation if possible, but, if not, then by compulsory legislation.

The Status of Union Labor

A complex array of problems arose in connection with union labor. For years unions had been gaining ground rapidly. Collective bargaining was established by law and a great body of legislation, administrative

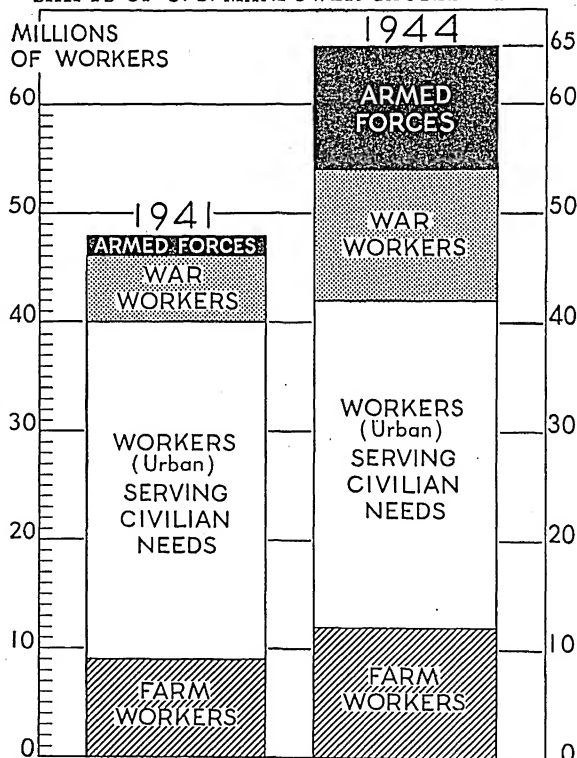
procedure, and court decisions favorable to labor had grown up (see Labor). The unions were reluctant to risk their hard-won gains. But it was clear that these gains included many legitimate peacetime practices which could be grievous handicaps in time of war. How to preserve the rights of union labor without hampering the war effort was the problem.

On Dec. 17, 1941, representatives of labor and industry met at the call of President Roosevelt to devise a wartime labor policy. The conference agreed upon a three-point policy:

1. No strikes or lockouts for the duration.
2. Peaceful settlement of all labor disputes.
3. Establishment of the War Labor Board to arbitrate disputes.

The labor laws prescribed "time and a half" for work in excess of 40 hours a week, and "double time" for work on Sundays and holidays. The latter provision was criticized on the ground that the government was demanding the operation of war plants seven days a week; that men were working in shifts to accomplish this; and that it was unfair to pay extra to those whose shifts happened to include a Sunday or a holiday. On Sept. 9, 1942, President Roosevelt suspended this provision and ordered double time paid only for a seventh consecutive day of work.

SHIFTS OF U. S. MANPOWER CAUSED BY WAR



Observe the increase in the grand total of people with jobs or in uniform—from 48 million to an estimated 65 million. The increase includes young people just out of school, a very large number of women with their first jobs outside the home, and many handicapped people once considered unemployable. Note how the number of farm workers rose by three million as the food needs of the armed forces mounted and lend-lease food shipments to allied countries increased.

ONE SOLUTION TO THE HOUSING SCARCITY PROBLEM



As the ranks of war workers expanded by the millions, it became increasingly difficult to find places for them to live near their work. Federal housing projects like this one at Columbus, Ga., soon sprang up in defense industry areas throughout the country. The group of multiple-family dwellings shown here housed 612 families.

With the hope of bringing to bear on war production the many valuable ideas of those who actually work with the tools, machines, and other industrial equipment, Donald Nelson early in 1942 proposed the voluntary establishment in war plants of labor-management production committees. These committees, representing both the plant executives and the workers, were to discuss all suggestions for doing the work better or faster and apply them if they seemed promising. By October more than 1,500 plants, employing over 3 million men, had adopted the plan and in nearly all instances reported great success, not only in improved production but in friendlier labor relations.

The Imperative Need for Housing

Closely related to the problem of manpower was that of housing. There was a general housing shortage even before the war, and pressure for new living accommodations had been rising sharply ever since large-scale war production began in 1940.

Difficulties were multiplied by shifts in population as workers moved to new centers of war work and filled the existing accommodations to overflowing. Some plants, particularly munitions factories, had been built in open country. Workers either had to travel scores of miles from home every day or had to be provided with completely new housing near by.

The government sought to reduce these drags upon the war effort with a special war-worker housing program expected to cost 3 billion dollars. Regions where

shortages existed were named "housing critical areas" and the existing restrictions on civilian building in those areas were modified. Providing adequate housing for the nation's war workers could not be done, however, in a few months. Even as far along in the war production calendar as May 1943, the President was asking Congress to appropriate an additional 400 million dollars to shelter the 1,100,000 war workers expected to migrate to war jobs within the next fiscal year.

The Work of the Schools in Wartime

IN DEALING with the manpower problem, the government had to give first thought to the men and women who could take their places at once in the armed forces or in industry. But the leaders of the nation realized that the young people now in school would play a big part later on. The kind and quality of American education became therefore a subject of graver interest than ever before.

At the time war broke out industrial training had been given to some 2½ million workers in 1,200 public vocational and trade schools, 155 colleges and universities, and 10,000 public school shops. As the nation's war production tempo was stepped-up, more inexperienced workers were given war industry training, and it was estimated that for the fiscal year 1943-44 about 3 million more people would be enrolled in training courses for war industry and

TRAINING FOR SKILLED WORK IN WAR INDUSTRY



Under the watchful eye of an instructor this high school boy is learning to operate an engine lathe. When his training is completed he will probably go to work in an army or navy arsenal, and when peace comes he will be ready to help rebuild normal industry.

agriculture. In February 1943, the War and Navy Departments launched a specialized war training program for men and women needed for the armed forces. The training was to be given by colleges and universities of the nation whose facilities would be acceptable to the particular branch of the armed services to be benefited. Within a month some 400 institutions had been approved, and the training of Army and Navy specialists began in many of them immediately.

Educators quickly sensed certain defects in the educational system, particularly in the fields of mathematics, physics, chemistry, biology, and geography. They hastened, therefore, to make certain necessary revisions that would enable the nation's schools to do a better job of preparing young people for the most effective service to their country. The main emphasis was to be placed on the war emergency program at the high-school and college level, where the government fostered "pre-induction" courses. These emphasized extended instruction in mathematics and science and preliminary work in technical crafts. Modern foreign language courses were to be more intensive, and health and physical education courses designed to help correct the defects that cause rejections from the armed services were recommended for immediate inclusion in the educational program.

It was recognized that the new wartime education should provide for the study of world geography, plans for postwar reconstruction and international organization and American traditions. That postwar teaching methods, particularly on the high-school and

college level, might be something quite different from those of prewar days began to be evident in 1943. The war gave prominent educators the opportunity to observe the efficient teaching methods used by the United States Army in its Infantry School where, since 1941, the Army had been training company officers with great rapidity. The Army's teaching formula in this training center was: explanation, demonstration, application, examination, discussion. It was believed by many leaders in education that the Army's teaching formula would influence civilian educational methods after the war.

Wartime "Extras" in the Schools

In October 1942, the War Manpower Commission launched the High School Victory Corps. To be eligible, pupils had to take courses in physical fitness, in mathematics or a science, and have some part-time war job like scrap collecting or helping with farm work. Early in 1943 it was proposed that one of the important activities of the Victory Corps should be the Victory Farm Volunteers program. Under this program, thousands of town- and city-bred boys and girls helped to relieve the farm manpower shortage by working on the farms of the nation during vacation.

The Effects of War upon Civilian Life

THE QUICK and cheerful way in which American civilians adjusted themselves to war was a tribute to their traditional com-

mon sense and a disappointment to the Axis leaders, who had freely prophesied a breakdown of public mor-

BEGINNING TO APPRECIATE THAT "WE'RE REALLY IN IT"



A typical group of American civilians cheerfully waiting in line outside a Chicago school building to get their first ration books. Such scenes, enacted in every community throughout the nation, brought the war "close to home."

ale in America. When they were called upon to face the pinch and perhaps the perils of a total war, the people surprised even their own leaders.

Organization of Civilian Defense

As far back as 1940, the ruthless bombing of Great Britain and the realization of how far bombing planes could fly had suggested the imperative need of preparing in advance against possible air raids on American cities. In May 1941, the Office of Civilian Defense (OCD) had been created to deal with this and other questions of civilian security in wartime. After some preliminary experiments with a centralized control of civilian defense work, it was found that requirements differed widely from place to place and that local control would be needed.

The Office of Civilian Defense as finally set up in April 1942 consisted of a central board, which determined general policy, and local defense councils. These councils planned measures to fit their own neighborhoods. Each community had a commander who supervised *block captains*. Under the block captains were *wardens* and other assistants (*auxiliary police, auxiliary firemen, bomb squads, fire watchers, rescue squads, etc.*) who were responsible for the organization of defense activities within their particular city blocks. Practically all the larger cities of the nation held practise *blackouts* at infrequent intervals,

in which the various units of the Warden Service familiarized themselves with the duties they would be called upon to discharge in an actual raid or other emergency.

Meeting "Home Front" Needs

Ready to help at critical points in civilian defense and relief stood the veteran organization of the American Red Cross. It had gone into action in Hawaii and the Philippines when the first shots were fired. Through the International Red Cross Committee in Geneva, Switzerland, it was doing all it possibly could to get letters, food, and clothing through to American prisoners of war in Japanese hands. On the home front it added to its usual relief work the following activities: (1) first aid in Civilian Defense; (2) care of shipwrecked sailors and war refugees; (3) enrollment of nurses for service with the armed forces and on the home front; and (4) mobilization of the Junior Red Cross to aid in the war effort (*see Red Cross*).

So many nurses had gone into service with the armed forces that the number available to care for civilian patients was far from adequate. The shortage became so acute that in June 1943 a drive was started to enroll 65,000 young women in the country's 1,300 nursing schools. Also about 1,000 Child Care Committees were organized over the nation to care for the small children of mothers who had war jobs.

Precautions against Spies and Sabotage

As soon as the news of the attack on Pearl Harbor reached Washington, the government put into effect its long-prepared plans against spies and sabotage. Factories where planes, tanks, guns, and ammunition were being made were already under guard to protect military secrets. But now guards were stationed at airports, shipyards, railway centers, and other strategic points to prevent damage by enemy agents. Amateur radio sending stations were ordered to shut down and privately owned airplanes were grounded. The Japanese fishing fleet in Los Angeles harbor was put under military quarantine. The Federal Bureau of Investigation had rounded up on the first day more than 1,000 aliens identified as active agents of the Axis powers. This had been made easier by the compulsory registration of all aliens completed in 1940.

In the forefront of the Nazi fifth column in the United States were certain recently naturalized leaders of the German-American Bund whose activities were directed from Berlin. On Oct. 3, 1942, Attorney General Francis Biddle moved to wipe out the Bund by stripping these men of their citizenship and interning them.

American citizens of Japanese ancestry (known as *Nisei*) presented a grave problem, especially in Hawaii and on the Pacific coast. Perhaps most *Nisei* were loyal to the United States; but the problem they presented lay in reconciling their rights as citizens with the paramount need of protecting the nation from the possibility of some of them becoming agents of the land of their forefathers. The government decided that persons of Japanese descent could not remain in certain *prohibited areas* after a specific date, and they were removed to *reception centers* where they lived while the government investigated their individual cases with a view to releasing the loyal Japanese-Americans.

Censorship and War Information

War brought the need for a strict censorship of the news. Under the broad emergency powers granted him by Congress, President Roosevelt established two simple tests for the publication of news: first, it must be true, and, second, it must not give aid or comfort to the enemy. To control the disclosure of information by press and radio, the President established the Office of Censorship under Byron Price, former news editor of the Associated Press.

This office prohibited the publication, without first obtaining official consent, of news about the movement of troops, ships, and important officials of the United States and allied nations; the detailed progress of war production; tests or performances of military equipment; weather conditions; location of fortifications or mine fields; and about a hundred other topics.

The Office of War Information was created in June 1942. Before that there had been several government information agencies, but now they were all combined

into one office under the direction of Elmer Davis, noted writer and radio commentator. The new bureau's principal duties were to originate radio programs and motion pictures that would clearly inform the public of the progress of the war effort, and to coordinate the various federal information-giving agencies for the purpose of releasing accurate war information to the public and the world at large.

Rationing and Price Ceilings

WAR always causes a shortage of supplies for civilian use. Some are consumed in making weapons, some may be cut off at the source by the enemy, and some cannot be produced because men and machines have turned to other work. Yet as supplies diminish, the amount of money in civilian hands tends to increase. The government pours out its funds, profits grow, and wages rise. Despite higher taxes and the curtailment of many businesses and occupations, a general "dollar prosperity" or "war inflation" spreads over the nation. The government must see to it, therefore, that available civilian supplies are distributed fairly, and it must check the rise of prices so that those who have little or no share in the "war boom" are not victimized. The first means rationing; the second means price fixing.

Tires and Cars—First to Be Rationed

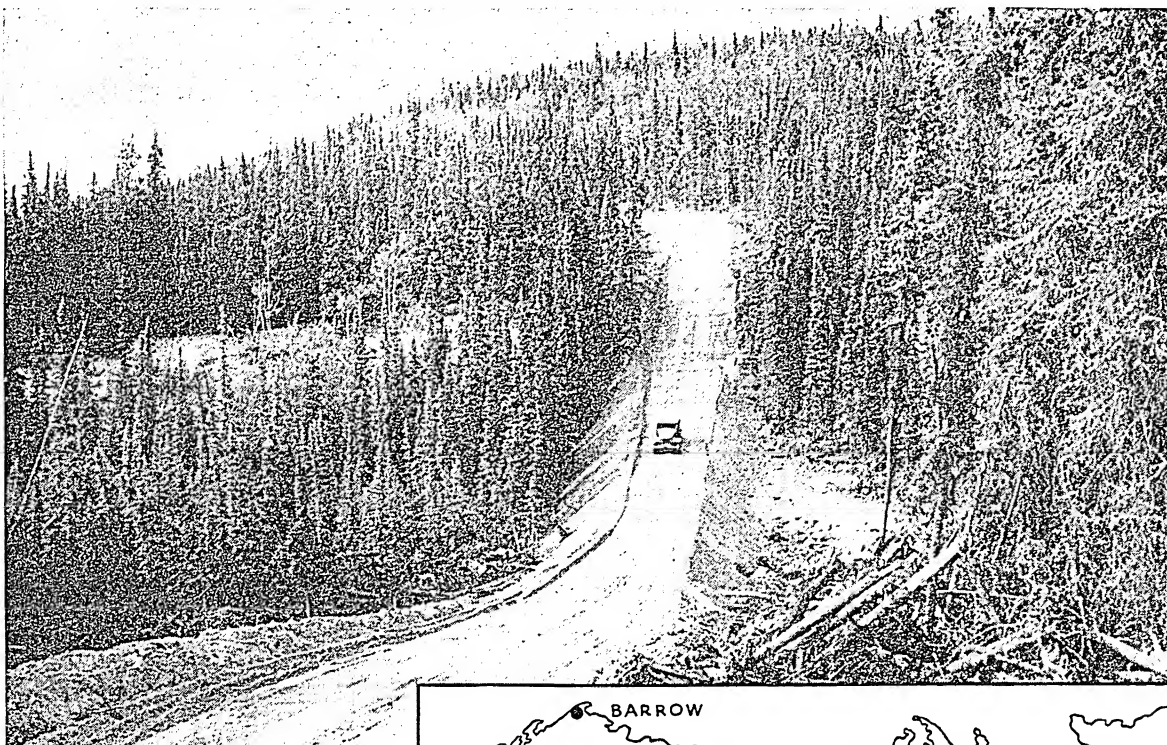
The rubber shortage was the first to strike civilian life. Four days after Pearl Harbor the government "froze" automobile tires by prohibiting all sales until Jan. 5, 1942. And after that date the existing supply of tires was to be sold only to "essential users." To get a new tire a driver had to prove that the operation of his car was necessary to the health and welfare of the community or to the prosecution of the war, and he had to turn in a worn-out tire in exchange. Dealers were required to declare the number of tires they had in stock; monthly quotas for each community were set up; and local boards were appointed to issue purchase permits for each tire sold. There were about 8 million new tires to be distributed in this way. The average peacetime consumption had been 48 million a year. Before long, restrictions were placed also on the use of rubber to recap and retread old tires.

Automobiles came next. The manufacture of cars for civilian use stopped after Feb. 1, 1942. Stocks in the hands of dealers were frozen from January 1 to March 2. Thereafter, every purchaser had to prove his essential need before the sale was allowed. There were about 480,000 new automobiles on hand.

Gasoline and Food Rationing

It soon became apparent that some means would have to be found for "rationing" the use of tires already on the roads. In September the Baruch rubber committee asked for a nation-wide speed limit of 35 miles an hour and nation-wide gasoline rationing to force down the average mileage of American drivers. With the appointment of William M. Jeffers as rubber administrator, these recommendations were carried out. Gasoline rationing had already been in effect in the

WARTIME NECESSITY SPEEDS WILDERNESS HIGHWAY



eastern states since May 15, because the sinking of tankers by submarines had caused a petroleum shortage along the whole of the Atlantic seaboard. Nation-wide gasoline rationing became effective in December, but the gasoline allotment to eastern drivers was smaller than for those in other sections. By June 1943, pleasure driving in 12 eastern states was prohibited, and the amount of gasoline allowed eastern "B" and "C" ration coupon-holders—those whose business activity contributed to the war effort, as distinguished from "A" coupon-holders, or nonwar-workers—was drastically reduced.

Increased American participation in the war—and its attendant greater drain on the nation's gasoline supplies—necessitated a 25 per cent reduction in the value of gasoline coupons in central and midwestern states on August 16. By October, civilian gasoline allotments were about 500,000 barrels (42 gallons to the barrel) short of the prewar supply of approximately 1,700,000 barrels a day in 1941.

The lack of ships to bring normal supplies from different parts of the world was responsible for other shortages. Foodstuffs such as sugar, tea, coffee,



Military urgency drove United States Army engineers to complete in record time the Alaska Highway (also called the Alaska-Canada or Alcan Highway), running from Dawson Creek in British Columbia across the northern Canadian wilds to Fairbanks, Alaska. The picture at the top indicates the construction difficulties encountered in that rugged country of forests, lakes, and mountains. The map shows the road's course and the railway links with Edmonton, Alberta, at the south end; with Seward, Alaska, at the north; and with Skagway, Alaska, about halfway up.

and bananas were chiefly affected. Sugar was the first food to be rationed. The rationing plan was designed to put an end to hoarding and bring hidden sugar into use. It went into effect in May 1942. At

that time 131 million people—virtually the entire population—were registered.

A separate coupon book containing numbered coupons was issued to each man, woman, and child in the nation. The method of merely numbering the coupons instead of printing on them the amount of the ration made it possible for the government by public announcement to increase or decrease the ration value of the coupons. Furthermore, it allowed the original sugar-ration books to be used for other rationed foods as the need arose simply by allotting for each kind of food coupons bearing certain numbers. This was done when coffee was rationed in November.

On March 1, 1943, the rationing of commercially processed vegetables, fruits and fruit juices, and all canned soups began. It was found necessary to ration more than 200 kinds of these foods because they were the ones most easily transported to the American armed forces overseas; consequently, their use at home had to be regulated by some method that would ensure everyone's receiving a fair share of the quantity left for civilian consumption.

The method selected was "point" rationing, long before found practical in England. Under this system, a second rationing book was issued to every adult and child in the nation containing coupons marked 8, 5, 2, and 1. The foods to be rationed were assigned varying point values depending on their scarcity. Each person was allowed to "spend" a certain number of points within a given period as he chose—on smaller quantities of "high-point" foods or larger quantities of "low-point" foods. During March, for example, the expenditure of 48 points a person was permitted.

On March 29 canned fish and meat, along with fresh meat, cheese, butter, and cooking fats and oils, were rationed on a point basis by means of the red coupons in the second ration book. War Ration Book No. 3—designed to replenish both the unit and the point coupons of the first two books—was distributed in June 1943. A fourth ration book, supplementing Book No. 3, was issued in October.

To further the production and distribution of all foods, Secretary of Agriculture Claude R. Wickard had been named food administrator. In March, however, he was succeeded by Chester C. Davis, former head of the Agricultural Adjustment Agency, and Wickard returned to his normal duties as head of the Department of Agriculture. Then in June 1943, Davis resigned and the President named as his suc-

cessor Marvin Jones, who was chairman of the United Nations' food conference held the preceding month.

So-called "black markets" began to flourish where buyers and sellers conspired to trade illegally in rationed goods at prices above the fixed ceilings. These markets dealt at first in tires, gasoline, and meats. They soon spread, however, to other rationed items to a degree that threatened to disrupt civilian supply. Determined efforts were made to stamp them out.

The first item of clothing to be rationed was shoes on February 9. This rationing was made necessary by the critical shortage of heavy-sole leather. More than one-third of the total supply had been allocated to military and lend-lease purposes. Under the edict, sales of shoes were to be limited to three pairs a year for each person. Although other clothing materials were becoming scarcer—particularly wool and cotton—because of conversion to war uses, it seemed unlikely that more clothing items would have to be rationed.

Control of Wages and Farm Prices

Even before the United States went to war, the Office of Price Administration had been set up under the direction of Leon Henderson to control the prices of critical materials. He was empowered to freeze the prices of nearly everything, except farm products, and maximum prices had been set on many raw materials and manufactured articles in the wholesale trade.

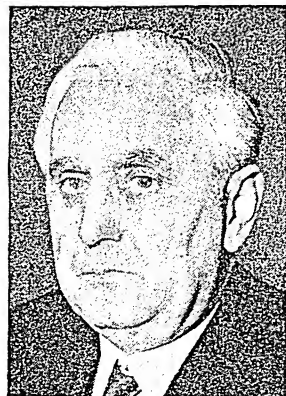
But retail prices were rising rapidly under inflationary pressure. As living costs went up, labor leaders were asking for a corresponding increase in wages, which would only push prices up still more.

On April 27, 1942, the President sent a message to Congress pointing out the danger of inflation and urging that steps be taken to check it. Within 24 hours the Office of Price Administration issued a price-fixing order covering nearly all consumer goods. It prohibited any merchant from selling his wares at a price greater than the highest he had

charged during the previous month of March. And, wherever practicable, merchants were required to post their ceiling prices. Rents in the designated areas were fixed in the same manner, and instalment buying and retail store credits were regulated to stop people from going into debt to buy luxuries.

But nothing was done at that time toward the positive control of wages and farm prices. With these still free to climb upward, the trend toward inflation continued. On September 7 President Roosevelt called

COMMANDERS ON HOME FRONT



At the top, Donald M. Nelson, chairman of the War Production Board (left) confers with William M. Jeffers, rubber administrator. Below, Leo T. Crowley, director of the Foreign Economic Administration.

upon Congress to remove the barrier it had raised against farm price control, and on October 2 the desired legislation was passed.

The next day the President ordered wages and farm prices stabilized at the levels that had prevailed on September 15. Thereafter wage changes could be made only with the approval of the War Labor Board and only to correct some manifest injustice or inequality.

Salaries over \$5,000 a year were frozen, except when the person in question was promoted to a more difficult position. Regulations were to be worked out so that, "insofar as practicable," no salary should exceed \$25,000 a year, after deductions had been made for taxes, insurance, and other fixed obligations. This salary limitation was later repealed by act of Congress. To administer the new regulations, the President created the Office of Economic Stabilization and named as its director Supreme Court Justice James F. Byrnes, who resigned from the court immediately to assume his new duties. Shortly thereafter, Prentiss M. Brown succeeded Leon Henderson as head of the Office of Price Administration when opposition to Henderson led to his resignation (see Roosevelt, Franklin D.).

Meeting the Gigantic Cost of Total War

THE WAR appropriations of the United States were 64 billion dollars at the time of Pearl Harbor. It was estimated that for the fiscal year ending in June 1944 American war expenditures would be about 104 billion dollars.

This staggering war bill must be paid by the American people in one way or another. They were prepared to pay a considerable part of it on a cash basis. The national income had risen from about 77 billion dollars in 1940 to about 116 billions in 1943. It was expected that in 1944 the national income would rise again to about 146 billions. From this income the people could make cash available for war expenses either by taxes or by loans to the government through the purchase of bonds. To pay so far as possible in taxes was desirable from the standpoint both of the present and of the future.

Mindful of the nation's war-spending needs, the President's 1942-43 budget message to Congress in January 1942 called for total government expenditures of around 80 billion dollars, of which more than 75

billions were for war purposes. The President estimated that about 23 billions of this amount would have to come from taxes.

Huge Tax Increases

In order to increase tax collections some 10 billions over what they were the year before, Congress on October 20 passed a new bill that drastically increased most taxes, particularly income taxes.

Personal exemptions were cut from \$1,500 to \$1,200 for married persons, and from \$400 to \$350 for each dependent. The normal tax rate for individuals went up from 4 per cent to 6 per cent. In addition, a new Victory Tax of 5 per cent was imposed on all individual incomes in excess of \$12 a week, beginning Jan. 1, 1943. Persons who earned wages and salaries had this tax deducted from their

INVESTING MONEY IN LIBERTY AND SECURITY



These war workers are putting a share of their earnings into war savings bonds. This helps to win the war, to halt inflation, and to insure their own future.

pay checks each payday by the employer. Taxes levied on corporations also were greatly increased.

The President's 1943-44 budget was even more staggering. It called for total expenditures of about 104 billion dollars, of which 100 billions were to be spent for war production. How to raise the increased taxes necessitated by this budget provoked considerable debate in Congress. Finally in June, Congress passed a "pay-as-you-go" tax bill that provided a federal deduction of 20 per cent, after exemptions, from pay checks starting July 1. Congress, however, still had not enacted legislation to raise income tax rates by the time the President told in January 1944 what the nation's money needs would be during the fiscal year 1944-45. The new budget estimated expenditures of 100 billion dollars, of which 90 billions would be for war. The President asked for immediate increases in federal taxes to furnish part of these funds. But Congress ignored his demands, and in February passed a tax bill that provided new revenue of only 2 billion 300 million dollars instead of the 10½ billions he requested. Roosevelt vetoed the "inadequate" measure, but Congress promptly passed it over his veto.

National Debt Limit Increased

Because taxes were not high enough to meet more than a small part of the largest war expenditures in the nation's history, the government was compelled to negotiate loans through the sale of war savings bonds and stamps. To make this possible, the national debt limit had been raised in 1943 to 210 billion dollars. Since the United States had begun its war preparations,

the Treasury Department had conducted four bond-selling drives. A fifth war loan campaign was scheduled for the summer of 1944.

Growing Manpower Problems

As the war progressed, acute manpower shortages developed. Military officials insisted that the armed forces number about 11 million men by the end of 1943. To ensure reaching this figure, on April 12 dependency was eliminated as a reason for draft deferment, and by November married men who had children were being inducted into service. Their induction was made feasible by further raising payments to servicemen's dependents in October.

In war industries, the demand for workers, particularly in the skilled trades, increased continually as those industries expanded. By April, about 4 million women were in war jobs; by September, approximately 17 million women were employed in all lines of industry and in agriculture, compared with only 12 million in 1941. Meanwhile, food shortages threatened the nation because so many farm laborers either had been drafted into service or had migrated to higher paid war jobs. To ease the situation, draft boards on March 6 were instructed to keep farm workers in deferred classifications if they measured up to minimum output standards. And thousands of laborers from Mexico, Jamaica, and the Bahamas were imported as farm workers. Then in June the War Production Board ordered farm machinery output doubled in the last half of 1943. By fall all factors in food production had improved sufficiently to make farmers confident that they could attain the record 1944 crop goals—8 to 10 per cent above 1943.

In an effort to release for war work a greater number of employees in nonessential industries, Economic Stabilizer Byrnes in February had announced an executive order establishing a minimum work week of 48 hours in so-called "labor shortage" areas. It was hoped that this would enable the industries concerned to carry on their operations with fewer men than before, and that the surplus workers would find jobs in war plants. To stop men already in war jobs from quitting them or being hired away by other war industries, War Manpower Commissioner McNutt in April announced a "job-freezing" order that prohibited 27

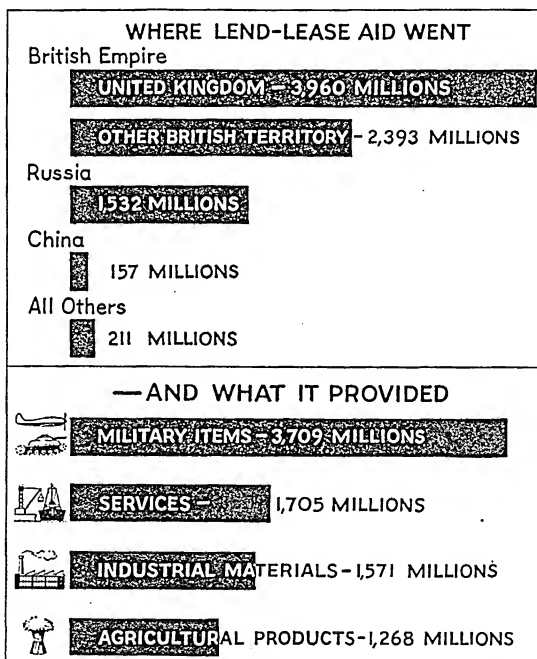
million war workers from changing from one essential job to another. Then on September 15—to combat the labor shortage in west coast war industries—a plan was launched to reduce the number of war contracts in that area to match the available labor supply. Along with this move, the Fair Employment Practices Committee took steps to see that Negroes were allowed to enter war industries on an equal footing with white workers. By March 1944 it was generally acknowledged that the manpower crisis in most war industries was past. But it was still acute in the armed services; and during March, draft boards were instructed to stop granting occupational deferments to men between the ages of 18 and 26.

Inflation and Labor

There were two troublesome sore spots on the "home front" in 1943—inflation and labor. Food prices continued to mount despite the President's "hold-the-line" order in April. The President proposed a plan to combat the rising cost of food by rolling back prices through subsidy payments to food producers. Congress disagreed with the administration's policy, believing that subsidies would lead to even greater inflation. In July, Congress reluctantly yielded to Roosevelt's wishes and permitted the program to go on. And on Feb. 28, 1944, the Commodity Credit Corporation, which paid subsidies to growers of certain agricultural products, was extended to June 30, 1945, despite congressional skepticism about its effectiveness.

On the labor front, strikes in the rubber and coal industries plagued the war effort during the summer. Four times within six months the nation's hard-coal miners under the leadership of United Mine Workers' president John L. Lewis, struck for higher wages. A storm of public protest raged

against these strikes, which were in violation of labor's no-strike pledge. Twice the government took over control of the mines—the last time after an infuriated Congress had passed an antistrike bill over the President's veto on June 25. Finally in November an agreement was reached between the mine workers and Secretary of the Interior Ickes on behalf of the government whereby the striking miners would receive a \$1.50-a-day wage increase, and the miners returned to work. Their victory was the forerunner to wage-



This chart shows how the \$8,252,733,000 of lend-lease aid was distributed from March 1941 to January 1943. On March 11, 1943, legislation was enacted to continue this kind of aid until June 30, 1944. In June 1943 an added 6 billion 200 million dollars was voted, raising total appropriations to 25 billion dollars. By early 1944, the total to date of lend-lease aid given by the United States to friendly nations amounted to more than 18 billion dollars.

increase demands and threatened strikes among steel and railway workers. So dire was the threat of the railroad employees to stop work if pay increases were not forthcoming by the year's end, that the President, on December 27, ordered the Army to take over the nation's railroads. But on Jan. 18, 1944, the roads were returned to their owners after the wage dispute was settled to the workers' satisfaction. All told, there were 3,737 strikes throughout the nation in 1943—double the average for the 15-year period preceding Pearl Harbor.

Setting Production Records

Despite strife in various phases of the nation's war effort, industry continued to set records in 1943. In November a complete new plane was being finished every five minutes, and almost 86,000 planes of all types were produced in 1943. Even greater aircraft production—more than 100,000 planes—was contemplated for 1944. Shipyards were equipped to turn out more than eight aircraft carriers a month. By the end of 1943, 164 new merchant ships were sliding down the ways monthly, and the total tonnage of new ships built in 1943 was more than 17 million compared with only slightly more than a million merchant tons in 1941. In almost every line, American war production had reached such a peak that some scaling down in favor of more civilian goods was possible.

Changes in War Agencies

To provide for more effective coordination of the various agencies, the Office of War Mobilization had been established May 27, 1943, with James F. Byrnes

as director. A War Mobilization Committee was also established to consult with the director. Members of the committee were Secretary of War Stimson, Secretary of the Navy Knox, Harry L. Hopkins of the Munitions Assignments Board, Donald M. Nelson of the War Production Board, and Fred M. Vinson, who succeeded Byrnes as director of Economic Stabilization. Other changes in various war agencies came in rapid succession during the fall. In September, William M. Jeffers resigned as rubber director and was succeeded by Col. Bradley Dewey, his deputy director. Jeffers gave as his reasons for retiring the fact that the synthetic rubber program was "over the hump," and he wanted to return to his former job as president of the Union Pacific Railroad. Then on October 21, Prentiss M. Brown resigned from his job as head of the Office of Price Administration.

AGENCY COÖRDINATOR



Bernard M. Baruch, called upon to unify the programs of the various government war agencies.

Brown's successor was Chester Bowles, former general manager of the OPA.

Five days later, the activities of three major government agencies—the Lend-Lease Administration, the Office of Economic Warfare, and the Office of Foreign Relief and Rehabilitation—were taken over by a new agency, the Foreign Economic Administration, with Leo T. Crowley as its director.

Then the crowning change occurred Nov. 6, when it was announced that Bernard M. Baruch—governmental adviser during the first World War—had been summoned to develop unified programs and policies for all the numerous war agencies and to prepare for the solution of postwar adjustment problems.

NATIONAL DEBT. Governments raise money in two ways, by taxing the citizens or by borrowing. The ordinary expenditures of a government, like those of a citizen, should not exceed its income; that is, the government's budget should be balanced. Frequently, especially in new, growing countries, the citizens are unable to pay in taxes the full cost of improvements which will benefit later generations. Hence part of the cost is met by selling bonds, to be paid off some time in the future. A large part of the national debts of Australia, Canada, and the South American countries arose in this way. The cost of wars, which are responsible for probably 90 per cent of the existing national debts of the world, could not be met in a single generation except by taxes too heavy to be borne. So these too are spread over a long period.

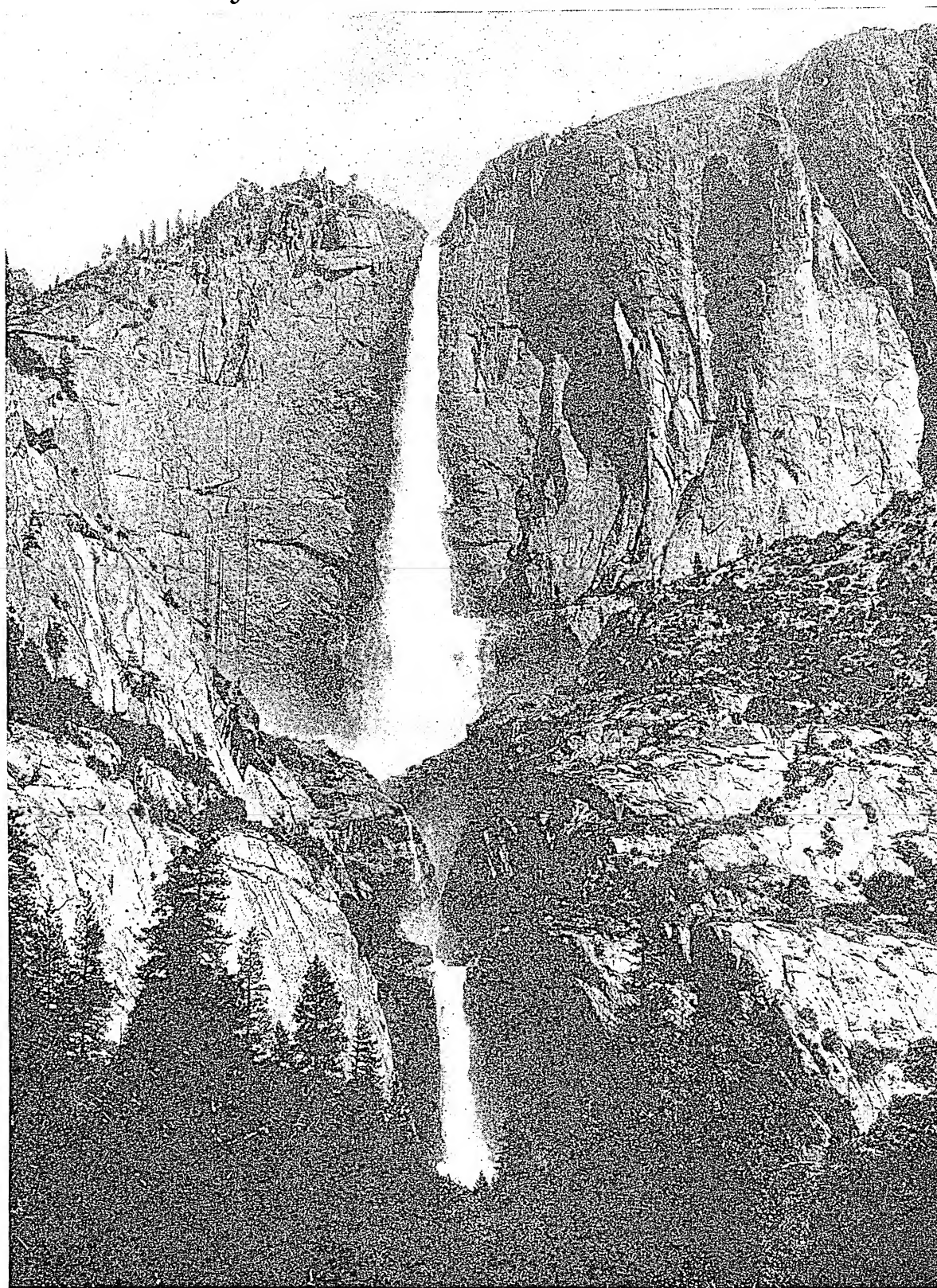
Usually a nation borrows by issuing bonds, payable on a certain date and carrying a fixed rate of interest. British "consols" (consolidated annuities), which constituted most of the British debt before the first World War, are not bonds but rather a perpetual stock; they are payable only at the government's option, after a specified date.

If a loan is made by bankers or citizens at home and is payable in the issuing country's currency, it is called an internal loan; if made in another country and payable in that country's currency, it is external.

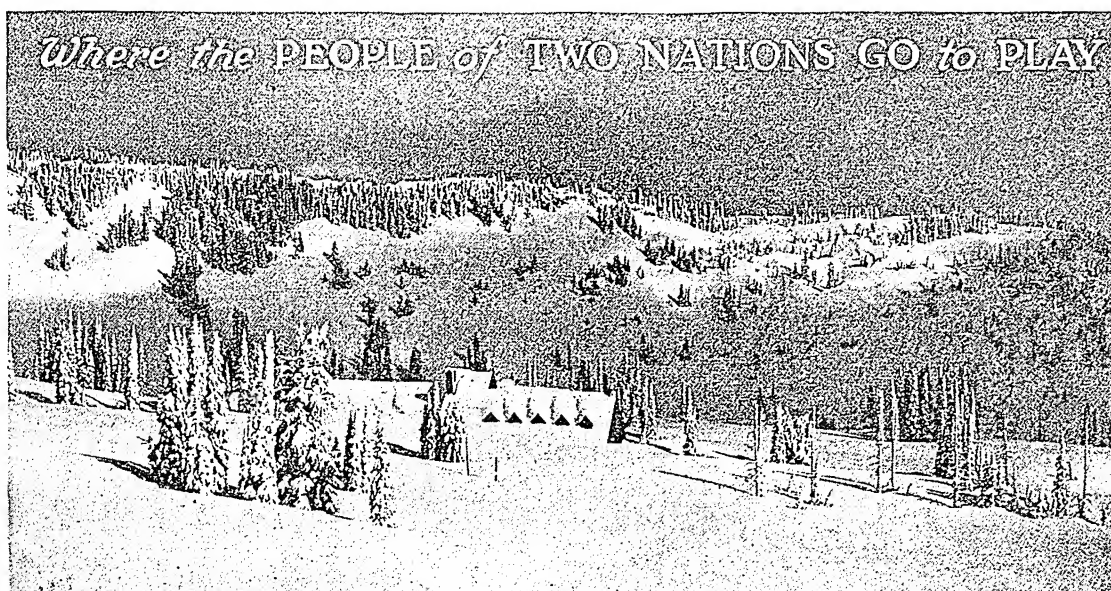
The national debt of the United States was created when Alexander Hamilton's plan was adopted for assuming the states' debts and for funding the cost of the Revolutionary War. It was \$75,463,476 in 1791. By 1835 this was almost paid off, but after the Civil War the debt was more than 2 billions. It was about one billion in 1899, and remained almost stationary until the first World War. After that war the United States owed 25 billion dollars; Great Britain, 40 billion; France, 46 billion; Russia, 25 billion; Italy, 18 billion; and Germany, 55 billion.

Congress in 1931 had set the legal limit of this country's national debt at 28 billions. Spending for unemployment relief, public works, and national defense necessitated raising this limit to 45 billions in 1938. After the nation entered the second World War, its huge armament program forced Congress to raise the debt limit to 125 billions in 1942 and to 210 billions in 1943.

A JEWEL OF THE YOSEMITE



Yosemite Creek plunges over the 1,430 foot escarpment of Upper Yosemite, highest free fall in the world, then tumbles through intermediate rapids only to drop another 320 feet to form Lower Yosemite Fall. The total plunge to the valley is half a mile.



On the Slopes of Majestic Mount Rainier, in Rainier National Park

NATIONAL PARKS AND NATIONAL MONUMENTS. The idea of preserving the wonderlands of nature for the benefit of all the people is an American inspiration. Formerly the choicest lands of a country were reserved in princely forests and parks for the privileged few. Today every citizen of the United States shares in the ownership of towering mountain peaks and dizzy canyons, of forests, glaciers, and waterfalls. In other countries too the United States national park system has served as a model, inspiring governments to set aside great areas as wild-life sanctuaries and places of recreation.

How the Park System Began

The story of the national parks goes back to 1870, when the Washburn-Langford-Doane Expedition discovered the marvelous Yellowstone region. As these men sat around a campfire at the junction of the Firehole and Gibbon rivers discussing how they might divide their find, Cornelius Hedges, later governor of Montana Territory, suggested that it was too great to be used for personal gain. He proposed that the government should make the tract a national playground.

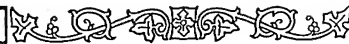
This idea was vigorously urged by Hedges and Nathaniel P. Langford as soon as they returned to civilization. The following summer the government sent the geologist Dr. F. V. Hayden to investigate the region. His enthusiastic support, added to the growing popular demand, won the approval of Congress. In 1872 President Grant signed the bill which made Yellowstone a "pleasuring ground for the benefit and enjoyment of the people." This was the first national park. Hot Springs in Arkansas had been set aside in 1832 as a government reservation to keep its medicinal waters from private exploitation, but it did not become a national park until 1921.

The parks are created by act of Congress. They may be established on lands already owned by the government, as in the case of most of the western parks. Or the lands in a proposed area may be deeded to the government. The Great Smoky Mountains National Park, for example, was given to the nation by the combined efforts of the states of Tennessee and North Carolina, public-spirited citizens, and the Laura Spelman Rockefeller Foundation.

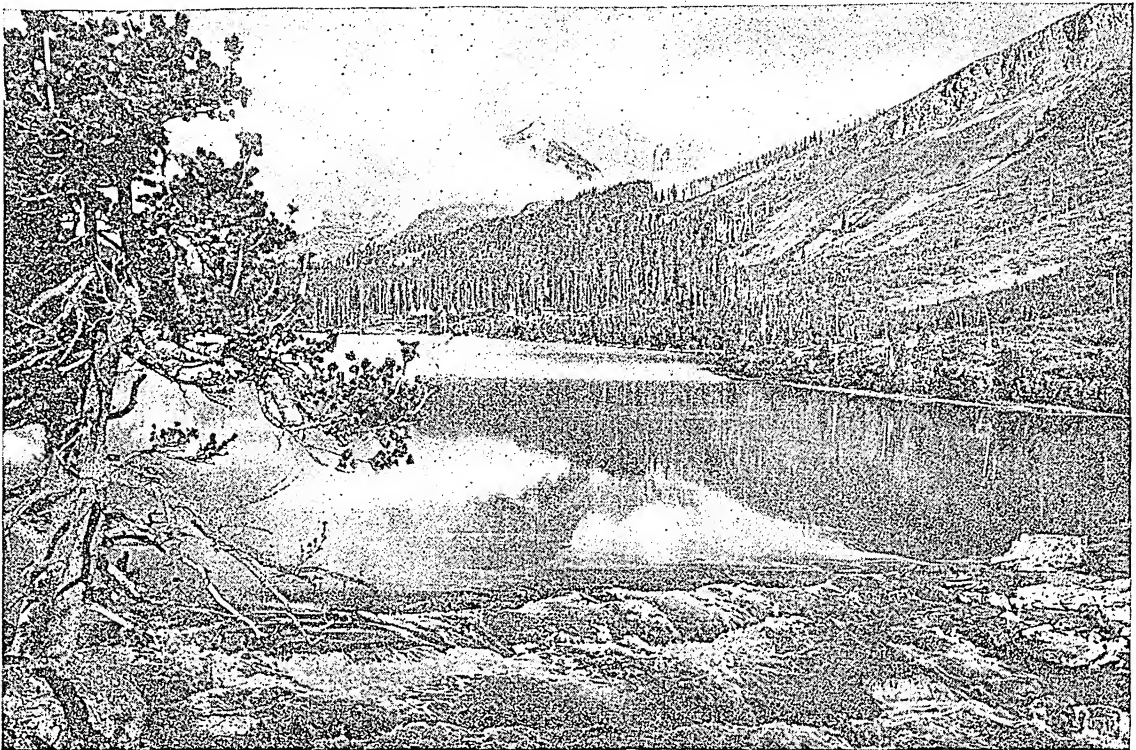
National Monuments

As settlement and industry spread to every corner of the country, there was a growing feeling that the government should save for the people not only scenic areas but also treasures of archeology, botany, geology, and history. The Antiquities Act of 1906 provided for a greatly enlarged system of parks. The president, by proclamation, is authorized to set apart as national monuments any lands owned or controlled by the United States containing "historic landmarks, historic or prehistoric structures, and other objects of historic or scientific interest."

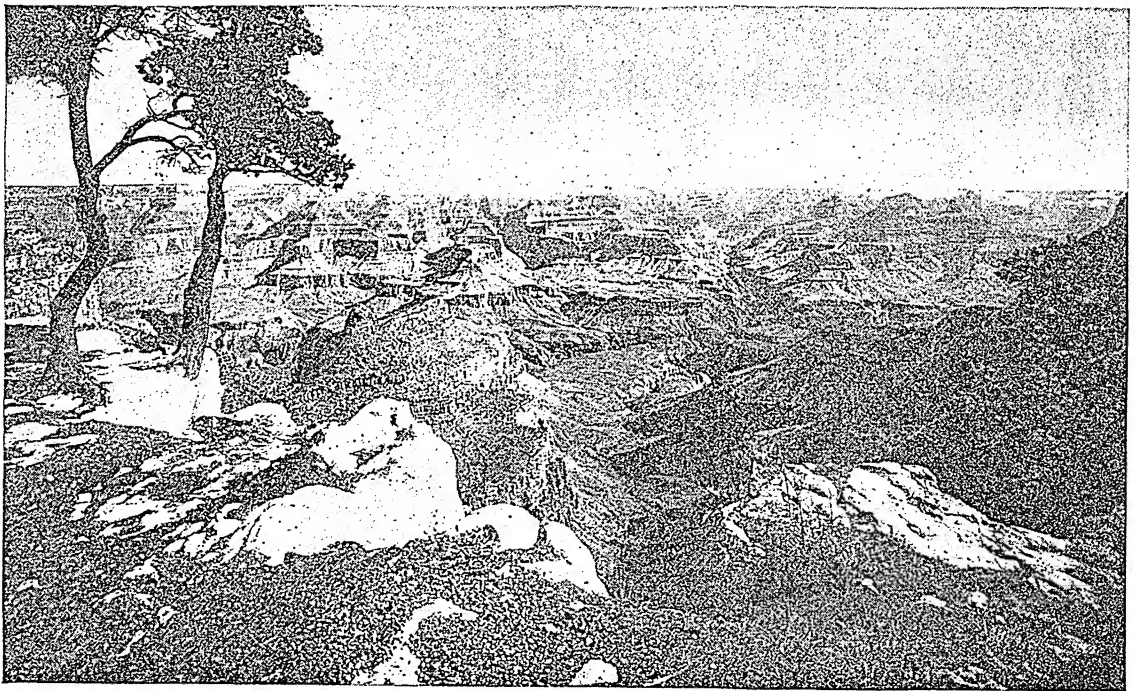
The national monuments are for the most part smaller than the parks. Exceptions are Katmai, which is nearly as large as the state of Connecticut; Glacier Bay, larger than Rhode Island; and Death Valley, which covers nearly 3,000 square miles. Several monuments preserve prehistoric cliff dwellings. Others, such as the Muir Woods, Organ Pipe Cactus, Joshua Tree, and Saguaro national monuments, protect rare plants and trees. Geological phenomena of great scientific interest are found in the Rainbow and Natural Bridges national monuments, the Badlands, Craters of the Moon, and Devils Tower. A fourth group includes historic structures, such as George Washington's birthplace and several old forts.



UP IN THE SNOWS AND DOWN IN THE DESERT

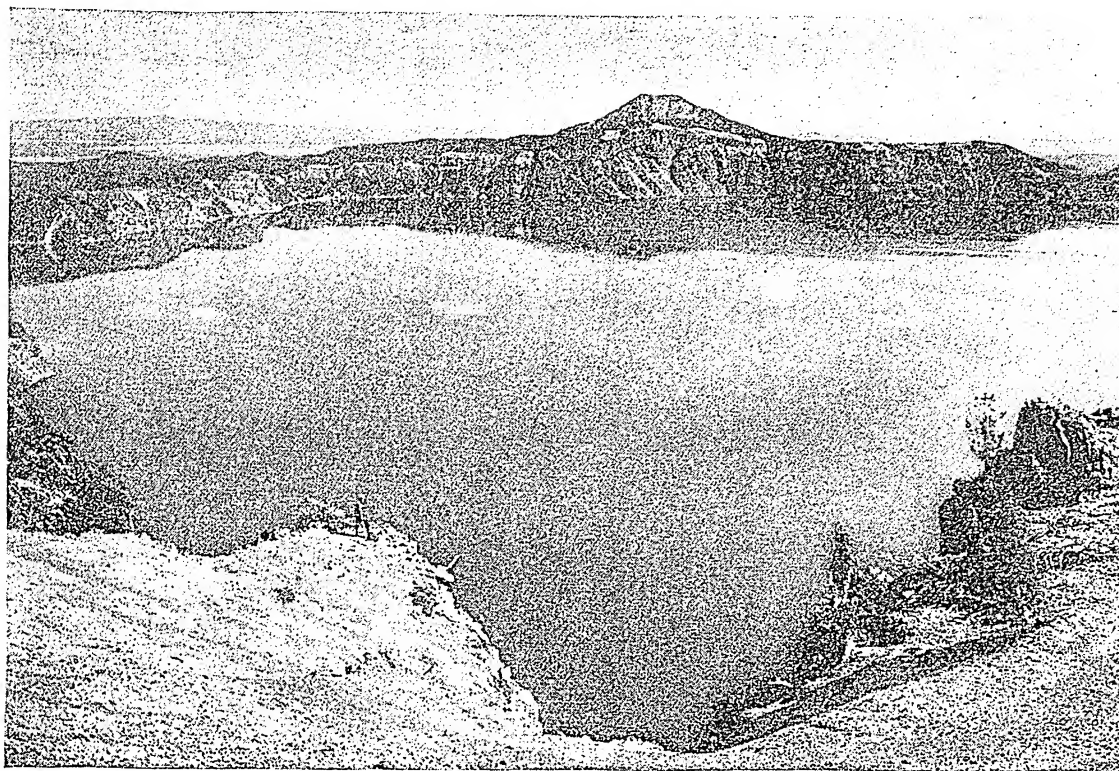


Few places in the world can boast the varied beauty found in Glacier National Park up near the Canadian border in Montana. Great forests of pine make spots of green against the vivid white of the snow, while lakes like giant mirrors in their calm reflect the serene blue and white of sky and clouds.

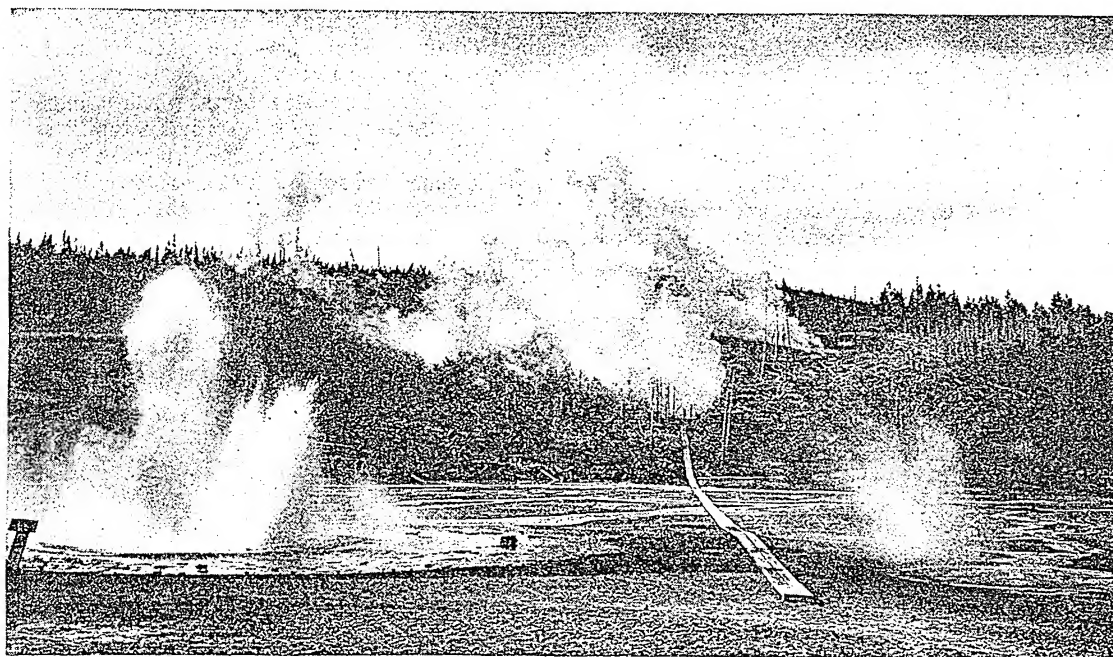


In sharp contrast with the cool lake of the north is this marvelous rock sculpturing in the Grand Canyon, down in the Arizona desert.

THE SERENE LAKE AND THE STEAMING GEYSERS

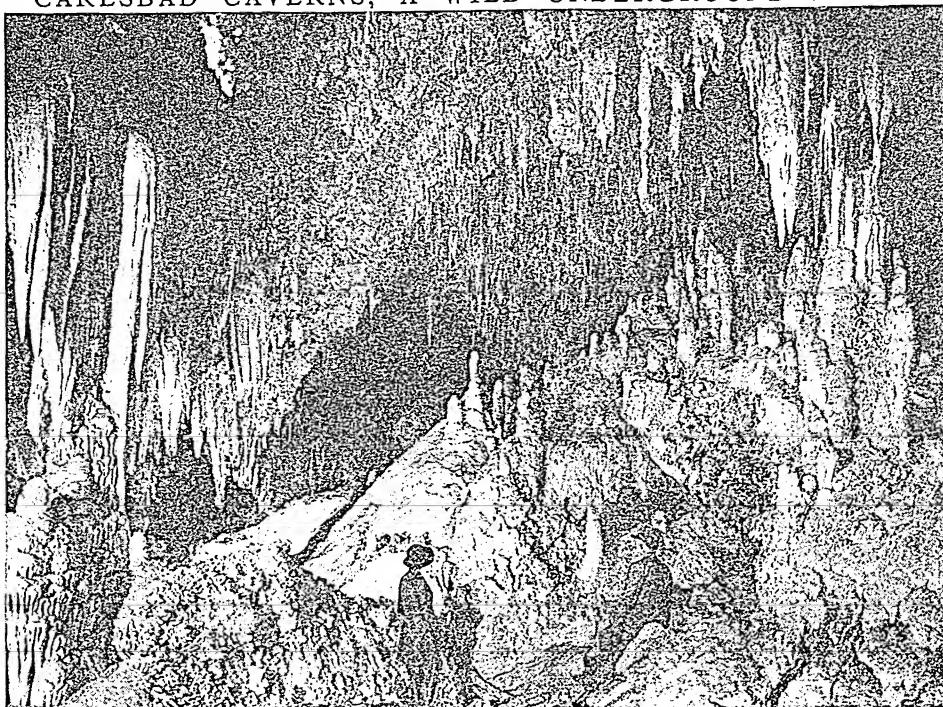


The brilliantly blue Crater Lake in southwestern Oregon lies high above the surrounding country in the crater of an extinct volcano. The lake has neither inlet nor outlet. Its waters are derived from rain and snowfall which are fairly balanced by seepage and evaporation. It is the deepest body of fresh water in North America—1,996 feet near the center.



The "Constant" Geyser in Yellowstone Park (left), and the "Black Growler" Steam Vent (right).

CARLSBAD CAVERNS, A WILD UNDERGROUND DREAM



A marvel of size and beauty is this labyrinth of caves beneath the foothills of the Guadalupe Mountains in southeastern New Mexico. The most impressive portion is the "Big Room," a corner of which is shown here, with its countless stalactites and stalagmites. This chamber is 4,000 feet long, 625 feet wide, and 300 feet high. Elevators take visitors down to chambers 750 feet below the surface.

In 1933 a presidential executive order gave the National Park Service control of military parks, battlefield sites, cemeteries, and other memorials maintained by the Departments of War and Agriculture.

Historic Sites

The Historic Sites Act of 1935 enlarged the scope of the park system still further by permitting the secretary of the interior to acquire "historic American sites, buildings, objects, and antiquities of national significance" with money appropriated by Congress for that purpose. He may also enter into agreements for the cooperative preservation and use of sites that are owned by states, corporations, or individuals.

The first such site (1938) was the Salem Maritime Historic Site, in Massachusetts. It includes the Derby Wharf, the Richard Derby house, and the old customhouse in which Nathaniel Hawthorne worked—all important memorials of the early maritime history of New England. Hopewell Village, in Pennsylvania, is being restored as an example of an 18th-century iron-making village. Other historic sites are the Philadelphia customhouse, home of the Second Bank of the United States, completed in 1824; Federal Hall Memorial in New York City, first United States capitol, where the Federal Subtreasury Building now stands; the palatial Vanderbilt mansion at Hyde Park, N. Y.; and the Jefferson National Expansion Memorial (see St. Louis, Mo.).

The Historic Sites Survey is making a nationwide study of historic buildings and sites with a view to preserving those of sufficient interest. The Historic American Buildings Survey is recording thousands of early American structures. Architectural photographs and measured drawings of these buildings are kept in the Fine Arts Division of the Library of Congress, where they are available for public use and reproduction.

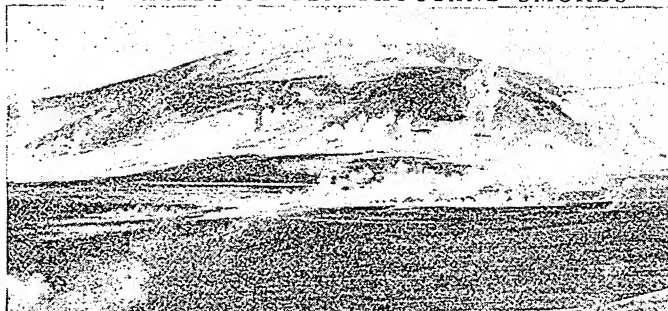
The National Park Service

The National Park Service, a major bureau of the

Department of the Interior, was established in 1916 to maintain the parks. It builds roads, trails, and living accommodations, which vary from hotels to camping grounds. The transportation and living utilities are operated privately, under government franchise and supervision. The chief official of each park is the resident superintendent. He is assisted by a force of permanent park rangers, which is increased in summer by temporary rangers and naturalists. The rangers enforce the regulations which make the parks wild-life sanctuaries. No hunting is permitted, and the natural features may not be disturbed in any way.

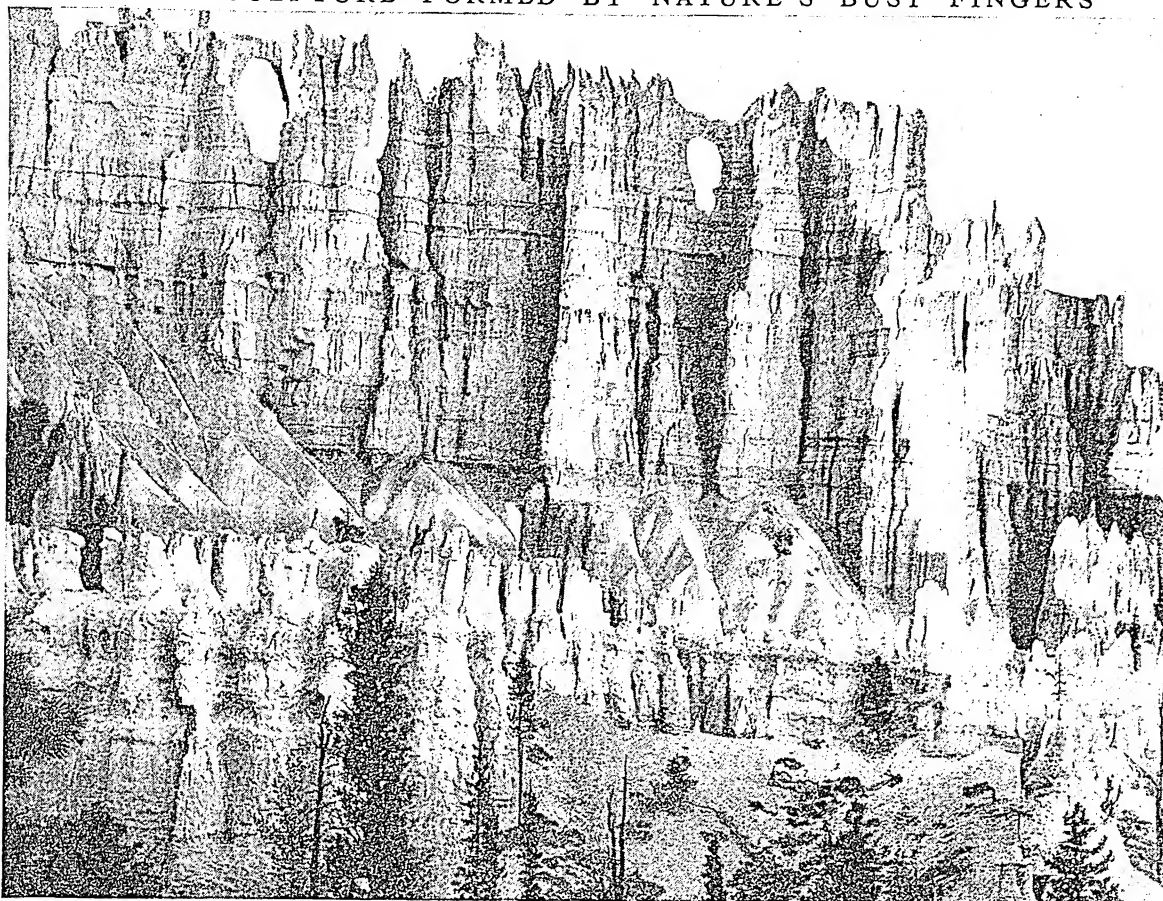
A valuable feature of the park system is the guide and lecture service. Ranger naturalists conduct par-

THE VALLEY OF TEN THOUSAND SMOKES



A view of the valley between the Mageik and the Katmai volcanoes, in an almost uninhabited region of Alaska, showing many of the smoking fissures that cover the ground. There are really millions of the "smokes," which burst forth when in 1912 Mount Katmai erupted, consuming all plant and animal life in its vicinity.

RARE SCULPTURE FORMED BY NATURE'S BUSY FINGERS



This extraordinary natural formation in Bryce Canyon National Park, Utah, is called Window Reef and consists of rock pinnacles eroded by time and elements into fantastic shapes and brilliant colors.

ties on the park trails and give informal talks in the evening. There are museums too designed to get the average visitor interested in finding out for himself just what the region has to offer. Some of the parks and monuments are of such great scientific interest that universities use them as outdoor classrooms in which to conduct summer schools.

Nominal admission fees are charged in certain of the parks and monuments. In others higher fees are charged for automobile permits, and in caves and various archeological and historical areas there are small fees for guide service.

United States Travel Bureau

Recreational travel within the United States is "big business," involving the expenditure of some five billion dollars annually. It draws more than 16 million visitors to the parks and monuments alone. To encourage this immense business and to increase travel from foreign countries, the United States Travel Bureau was created in 1937 under the jurisdiction of the National Park Service. It acts as a central clearinghouse for information, cooperating with state tourist bureaus, transportation companies, and other organizations connected with the travel industry. It

conducts radio programs broadcast to Latin American and other countries and distributes illustrated material on the scenic attractions of the United States.

The National Parks and Monuments

Following are the National Parks (N.P.), National Historical Parks (N.H.P.), and National Monuments (N.M.) The park and monument projects are also included in their alphabetical place.

Abraham Lincoln N.H.P., 1916, central Kentucky, near Hodgenville, 110.5 acres. The one-room log cabin in which Abraham Lincoln was born, enclosed in a granite memorial building of classical design. Sunken gardens and granite stairs leading up over terraces make an impressive approach to the shrine. The park includes also a part of the Sinking Spring Farm once owned by Thomas Lincoln.

Acadia N. P., 1919, Maine coast, 38.5 square miles. Includes part of granite, sea-girdled Mount Desert Island, and the bold headland of Schoodic Point which juts out from the mainland. Some Sound almost bisects the island, dividing into two groups its dozen or more low mountains. Cadillac Mountain, the highest point on the eastern coast of North America (1,532 feet), commands a magnificent view of sea and ragged coast. Wave-battered cliffs, hollowed at their base into thunderous caves, contrast vividly with the quiet interior of the island, where fresh-water lakes reflect the "murmuring pines and the hemlocks" of the forest that Evangeline knew. For this was once a part of the French colony of Acadia. Across Frenchman Bay, Schoodic Point

extends farther out into the open sea than any other point on the eastern coast. Sea and cliff, lake, stream, and forest harbor a great variety of bird and plant life. Samuel de Champlain discovered the island in 1604 and named it "l'Isle des Monts Deserts." In 1916 the United States government established it as Sieur de Monts National Monument. Three years later it was made the Lafayette National Park, the first national park in the eastern states. In 1929 it was given the present name.

Ackia Battleground N. M., 1938, Mississippi, near Tupelo, 49 acres. Site of the palisaded Indian village of Ackia, where on May 26, 1736, a band of English tradesmen and their Chickasaw allies defeated the French and Choctaws. The battle checked the movement of the French to extend their Louisiana empire eastward from the Mississippi.

Andrew Johnson Homestead N. M. Project, 1935, Greeneville, Tenn., 17 acres. The home and the tailor shop of the 17th president of the United States.

Appomattox Court House N. M., 1940, Virginia, 970 acres. Scene of the surrender of the Confederate Army under Gen. Robert E. Lee to the Union Army under Gen. Ulysses S. Grant, Apr. 9, 1865.

Arches N. M., 1929, east central Utah, 33,680 acres. Massive red sandstone eroded by desert winds into fantastic forms. The monument contains two tracts, the Windows and the Devil's Garden, separated by a wide desert valley.

Aztec Ruins N. M., 1923, northwestern New Mexico, 26 acres. An E-shaped pueblo apartment dwelling, three stories high, containing about 500 rooms. Several other smaller ruins are in the tract.

Badlands N. M., 1939, southwestern South Dakota, 150,103 acres. An eroded region between the White and the Cheyenne rivers. The heavy, nonporous clay soil is so steep that it washes badly and is bare of vegetation. Intermittent streams and torrential rains from cloudbursts have carved it into a maze of winding canyons, towering pinnacles, ridges, and isolated buttes. The Great Wall presents an impenetrable barrier miles long. Its top is serrated into countless towers, its sides scored with precipitous gulches. Horizontal bands of colored rocks stripe the grayish-white clay with red, purple, yellow, and green. Each color layer may be traced for many miles. The fossil beds in this area are among the largest known. They have yielded the remains of the saber-toothed tiger, three-toed horse, camel, giraffe, and rhinoceros. Only prairie dogs, coyotes, and jack rabbits roam the Badlands today.

Bandelier N. M., 1916, north central New Mexico, 26,026 acres. Ruins of prehistoric Indian cliff dwellings and pueblos in the canyon of the Rito de los Frijoles and on the Pajarito Plateau. Kivas, or ceremonial chambers, artificial caves, and stone sculpture have also been uncovered.

Big Bend N. P. Project, 1935, southwestern Texas, 1,232 square miles. The last great wilderness in Texas, where the Rio Grande bends to the northeast. The region is a semiarid plain from which rise the southernmost spurs of the Rocky Mountains. The Chisos Range is the highest and most rugged (7,835 feet). Virgin forests cover the mountains and harbor many wild animals. A dramatic view from the south rim of the Chisos Mountains overlooks 200 miles of Mexican and American desert and mountain country. Five thousand feet below, through steep-walled canyons, winds the river. The Mexican government plans to set aside a tract across the river to form an international peace park.

Big Hole Battlefield N. M., 1910, western Montana, 200 acres. Site of the battlefield where a small force of United States troops defeated a much larger band of Nez Percé Indians, Aug. 9, 1877.

Black Canyon of the Gunnison N. M., 1933, west central Colorado, 13,969 acres. Ten miles of the wildest and most spectacular stretch of a 50-mile gorge. It is 1,725 to 2,724 feet deep and 2,500 feet at its widest point.

Bryce Canyon N. P., 1928, southwestern Utah, 56 square miles. The Paunsaugunt Plateau ends abruptly in the sheer Pink Cliffs, which drop a thousand feet to the Paria Valley below. Cutting back into the plateau from these southward

facing cliffs are 14 bowl-shaped or box canyons. The largest is Bryce Canyon, three miles long, two miles wide, and a thousand feet deep. It is approached from the top of the plateau, from which one gazes down into a maze of pink, red, and cream-colored sculptured rock. Platforms and terraces, domes, spires, and temples fill the great bowl with a confusion of colorful forms. The Paiute Indians gave it a name meaning "red rocks standing like men in a bowl-shaped canyon." From Rainbow Mountain, at the south end of the park, may be seen 30 miles of the Pink Cliffs with Bryce, Black Birch, Aqua, and other beautiful amphitheaters. (See also Cedar Breaks N. M., Zion N. M., Zion N. P., in this article.)

Cabrillo N. M., 1913, Point Loma, southern California, 1/2 acre. Juan Rodriguez Cabrillo, discoverer of California, first sighted its shore at this point Sept. 28, 1542. It commands a beautiful view of sea and wide curving coast line, bordered with hills and distant snowy mountains.

Canyon de Chelly N. M., 1931, southern Arizona, 83,840 acres. Prehistoric Indian cliff dwellings in Canyon de Chelly, Canyon del Muerto, and Monument Canyon. They contain records of cultural progress covering a longer period than any other ruins so far discovered in the Southwest. The beginnings and development of agriculture, pottery making, and food storage may be traced in the relics unearthed in the cavern floors. Remains of the Basket-Makers underlie those of the later Cliff-Dweller and Pueblo periods. Along the canyon bottoms are the fields and summer hogans of the modern Navajo.

Capitol Reef N. M., 1937, central Utah, 37,060 acres. A great ridge of rock 20 miles long, deeply gashed by canyons and fantastically eroded. It is part of a "fault" or line of breakage, which occurred many millions of years ago when the horizontal rocks were forced upward 16,000 feet above sea level. The strata lie in relatively the same position they occupied before the uplift. Now they are exposed in the sheer face of the "reef," presenting a cross section of the geological history of the area. Petrified forests, extensive fossil deposits, cliff dwellings, and cliff paintings of prehistoric Indians attract scientists in many different fields.

Capulin Mountain N. M., 1916, northeastern New Mexico, 680 acres. The steep-sided cinder cone of a recently extinct volcano. Its crater has a diameter of 1,500 feet and a depth of from 75 to 275 feet below the rim. A broad platform at the base was built up by successive flows of lava. The cone may be no more than a thousand years old.

Carlsbad Caverns N. P., 1930, southeastern New Mexico, 77 square miles. Under the Guadalupe Mountains is perhaps the largest underground labyrinth in the world. The length of the caverns is not yet known. Many miles have been explored at levels of 750 feet, 900 feet, and 1,320 feet below the surface, but only a few miles are open to visitors.

Some of Carlsbad's great chambers are 300 feet high and thousands of feet long. Their walls are draped with pink-tinted curtains, hanging in folds so soft and graceful that it is difficult to realize they are stone. Frosty lacework adorns other walls. Jeweled fountains supported on pedestals and filled with turquoise-blue water are ornamented with onyx flowers. From the lofty ceilings hang thousands of glittering stalactites. The floors are a maze of stalagmites and flowstone in icy white, green, pink, purple, and tan. In one place the formations resemble a snow-banked forest; in another, a twisted tangle of thorn. There are giant totem poles, obelisks, towers, and domes elaborately carved. In hundreds of marble-lined pools may be found cave "pearls"—fragments of stone that have fallen into the pool, to be covered with layers of calcium carbonate, in much the same manner as the oyster builds up its pearl.

The limestone in which the caverns are hollowed was laid down in the sea many millions of years ago, according to the calculations of geologists. When the Guadalupe Mountains were later uplifted, the rock was cracked and broken. Rain water and underground streams flowing into and along the cracks slowly dissolved the rock. Long, branching cor-

ridors appeared. As the walls and ceilings of the corridors collapsed, great rooms were formed. Water dripping into the chambers evaporated and deposited the minerals which it carried in solution. With infinite slowness, drop by drop, the spectacular curtains, pillars, lacework, and other formations were created. Their brilliance and translucence are due to the fact that they are saturated with water. Wherever water seepage stops, they become dull and powdery in appearance. (See also Cave.)

Casa Grande N. M., 1918, south central Arizona, 472 acres. A group of prehistoric Pueblo Indian ruins, of which the "Great House" is the largest. Its adobe walls, four feet thick at the base, are the remains of a three-story building which had a central tower four stories high. Of particular interest are the "calendar holes" in the east and center rooms. At sunrise on March 7 and October 7, and on no other days, a shaft of light strikes through the outer hole and within a quarter inch of the inner. Undoubtedly the light originally shot through both holes, but the walls have settled and thrown the inner hole out of alignment. The device probably enabled the people to determine the beginning of the spring and fall seasons.

The history of these Indians is largely conjectural. It is believed that they came as nomads to this desert plain in the Gila Valley, and remained to build up a civilization based on agriculture. The ruins of their irrigation system are plainly visible. Some of the more primitive dwellings in the group may be 1,200 years old. The community was apparently abandoned between 1400 and 1450. The raids of warring tribes and exhaustion of the soil may have been the reasons for the exodus. Father Eusebio Kino, in 1694, was the first white man to see and describe the ruins.

Castillo de San Marcos N. M., 1924, St. Augustine, Fla., 18.5 acres. The oldest existing masonry fort in the United States was built by the Spanish between 1638 and 1756 to defend their Florida possessions. The fort is constructed of coquina (shell stone), with walls 12 feet thick enclosing a large open court. Like a medieval castle, it has a moat with a drawbridge and a portcullis. It successfully withstood a two months' siege by Gov. James Moore of South Carolina in 1702, and in 1740 Gen. James Oglethorpe of Georgia bombarded it for 27 days without success. After the United States acquired Florida in 1819 it was named for Gen. Francis Marion. Osceola, the Seminole Indian chief, was imprisoned here. The old Spanish name was restored in 1942.

Castle Pinckney N. M., 1924, Charleston, S. C., 3.5 acres. Part of the defenses of Charleston Harbor, built in 1810 to replace a Revolutionary fort on the same site.

Cedar Breaks N. M., 1933, southwestern Utah, 6,187 acres. Like Bryce Canyon to the east, Cedar Breaks is a vast amphitheater cut into the Pink Cliffs. The cliffs at this point are 2,000 feet high and mark the edge of the Markagunt Plateau. White or orange at the top, they shade into deep rose and coral, with splashes of dazzling white and sulphur yellow. As the sun and evening shadows play over the rocks they become molten gold, orange, blue, and purple. The amphitheater is half a mile deep and two miles wide. From its rim on the plateau top one gazes down into an astonishing confusion of brilliantly colored and strangely eroded rock. Beautiful forests cloak the rim. (See also Bryce Canyon N. P., Zion N. M., Zion N. P., in this article.)

Chaco Canyon N. M., 1907, northwestern New Mexico, 21,509 acres. The highest development of Pueblo Indian civilization is represented in the 18 major ruins in and about Chaco Canyon. Pueblo Bonito ("beautiful village") is the largest and most completely excavated ruin. It contained about 800 rooms and housed 1,200 or more persons. In the court are 32 *kivas*, or ceremonial chambers. Through the study of tree rings in the timbered ceilings, experts believe that it was built in 919, with additions extending over a period of nearly 200 years. The University of New Mexico and the School of American Research maintain a research station here with full-time and summer courses.

Chalmette N. H. P., 1939, Louisiana, 29.5 acres. Site of the battle of New Orleans, Jan. 8, 1815. An obelisk 110 feet

high marks Andrew Jackson's position during the battle.

Channel Islands N. M., 1938, southern California, 1,120 acres. Parts of Anacapa and Santa Barbara islands, set aside to preserve their fossils and their unique plant and animal life. A large rookery of sea lions flourishes today where once elephants lived and died. The islands are also of interest to geologists as examples of ancient volcanic eruption and active sea erosion.

Chiricahua N. M., 1924, southeastern Arizona, 10,695 acres. A region of volcanic rock, eroded into a maze of pillars and balanced rocks, and formations resembling animals and faces. Steep-walled canyons, 200 feet deep, and narrow fissures like streets or passageways separate many of the groups.

Colonial N. H. P., 1936, Virginia, 10.5 square miles. The history and life of colonial Virginia, reconstructed in three areas—Jamestown, first permanent English settlement in North America; part of Williamsburg, the old capital, which has been restored to its 18th-century appearance; and part of Yorktown, scene of the surrender of Cornwallis in the Revolutionary War. A parkway joins the three. (See Jamestown; Williamsburg; Yorktown.)

Colorado N. M., 1911, west central Colorado, 18,311 acres. A magnificently eroded escarpment that rises a thousand feet above Grand Valley. Numerous canyons cut back for miles from its face into the Uncompahgre Uplands. Along the sheer front, hundreds of red sandstone towers stand out from the main ledges like gigantic sentinels, 400 and 500 feet high. A scenic highway, the Trail of the Serpent, winds from the base to the top of the escarpment. At Cold Shivers Point, on the brink of a 1,000-foot precipice, it overlooks Columbus Canyon. A continuation of the drive, known as Rimrock Drive, skirts Red, Ute, and Monument canyons.

Crater Lake N. P., 1902, southwestern Oregon, 251 square miles. Like a sapphire jewel, this exquisite lake lies in the crater of an extinct volcano in the Cascade Mountains. Sheer cliffs from 500 to 2,000 feet high encircle its waters. From the forested rim, one gazes into a circular bowl about six miles in diameter. Evergreens cling to the steep walls, their dense green accenting the soft tones of the lava rock and the brilliant blue of the lake. Near the west shore rises Wizard Island, a symmetrical cinder cone 763 feet high. Off the south shore lies the Phantom Ship, a strangely twisted mass of lava resembling a ship under sail. The wonderful color is due to scattering of light by the water particles in a lake of exceptional depth and clearness.

The volcano in which Crater Lake lies was once a peak 14,000 or 16,000 feet high. Geologists call it Mount Mazama. Like the volcanic cones of today in the same range, Mount Rainier, Mount Hood, and Mount Shasta, its summit was snow-crowned, its sides scored with glaciers. But the top of Mount Mazama collapsed and disappeared into the depths of the volcano. Unlike some volcanoes which blow their heads off and scatter the materials for miles around, this mountain literally swallowed itself. The crater, known to geologists as a *caldera*, is the only one of its kind in the United States proper. Wizard Island, a miniature volcano, developed after the disappearance of Mount Mazama.

Craters of the Moon N. M., 1924, central Idaho, 48,184 acres. An area of comparatively recent volcanic activity. From the surface of the lava plateau rise many cinder cones. Spatter cones formed by lava bubbling from vents and a region of broken crater walls known as the Devil's Orchard make the visitor feel that he has been transported to the lonely face of the moon. (See Idaho.)

Cumberland Gap N. H. P. Project, 1940, Kentucky, Tennessee, and Virginia, 50,000 acres. The historic pass through the Appalachian Mountains traveled by Daniel Boone and other pioneers. The trail, later a road, through the pass was known as Boone's Trace, or the Wilderness Road. The park will extend for about 30 miles along the crest of Cumberland Mountain. It will include portions of the ancient Indian trail known as the Warriors Path, and the Wilderness Road from the city of Cumberland Gap, Tenn., to Cumberland Ford near Pineville, Ky. (See Roads and Streets.)

Death Valley N. M., 1933, southern California-Nevada, 2,981 square miles. A vast desert solitude hemmed in by brilliantly colored mountains (*see* Death Valley).

Devil Postpile N. M., 1911, east central California, 800 acres. A sheer wall of basaltic columns packed together like a pile of posts. As hot lava cooled, it contracted and separated into these columns of four, five, six, and seven sides, with diameters of one to two feet. Glaciers subsequently moved over the area, exposed the columns, and polished their surfaces. From the top, the Devil Postpile looks like a black mosaic or a tile-inlay flooring. The combination of basalt columns with glacial polish is found nowhere else in the world so far as geologists know.

Devils Tower N. M., 1906, northeastern Wyoming, 1,153 acres. A fluted column of volcanic rock, resembling a giant petrified tree stump. It rises 1,200 feet above the Belle Fourche River and 865 feet above the ridge that forms its base. The tower was created when molten lava forced its way upward into layers of sedimentary rock. The horizontal strata arch over the volcanic intrusion, forming a dome called a *laccolith*. Erosion has completely removed the covering of comparatively soft rock, and the much harder core of the dome stands out as a great pillar. Four other laccoliths in the vicinity are only partially uncovered, appearing like low hills. The columnar structure is due to contraction and cracking as the molten lava cooled. Devils Tower was a landmark of the pioneers in their overland journey to the West. In some directions it is visible for a hundred miles. This was the first national monument.

Dinosaur N. M., 1915, Utah and Colorado, 203,965 acres. The largest known deposit of fossilized dinosaur bones. Thousands of bones and many complete skeletons have been removed and sent to museums throughout the country. One of the most remarkable finds was a complete skeleton of a brontosaurus, 100 feet long and 20 feet tall. Scientists believe that the bones were washed downstream by flood waters from some unknown source, to become embedded in a sand bar. The sea encroached upon this area. Mud and sand were deposited to a great depth. Then came a long period of uplift, and the sea retreated. The sediments became rock and were forced into mountains and high plateaus. Ages later, erosion of the rock exposed the fossilized bones.

El Morro N. M., 1906, west central New Mexico, 240 acres. A mesa, or table-like rock rising 200 feet above the surrounding country, carved by erosion to resemble a castle or fortress (Spanish *morro*). For nearly 170 years El Morro was a refuge and camping place for the Spanish conquerors of the American Southwest. A cave on its south side, with a spring of cool water, could shelter a company of soldiers. The Spaniards carved the sides of the mesa with records of their journeys. The oldest inscription was made by Juan de Oñate on April 16, 1605. The last is dated 1774. Indian petroglyphs high on the cliff walls antedate the Spanish writings by hundreds of years. On the mesa top are the ruins of a prehistoric Indian pueblo.

Everglades N. P. Project, 1934, southern Florida, 2,272 square miles. The only tropical area in continental United States, notable for its mangrove and cypress swamps, its orchids, and its bird life (*see* Florida).

Father Millet Cross N. M., 1925, New York. A bronze cross 18 feet high on the Fort Niagara Military Reservation. It commemorates the services of Father Pierre Millet, French-Canadian Jesuit missionary, who did notable work among the Iroquois Indians of New York. He erected a wooden cross at the frontier fort on this site in 1688.

Fort Frederica N. M. Project, 1936, Brunswick, Ga., 80 acres. Ruins of the fort built in 1736 by James Oglethorpe as a defense against the Spanish.

Fort Jefferson N. M., 1935, 65 miles southwest of the mainland of Florida, 87 acres. A grim fort on Garden Key, one of the coral islands of the Dry Tortugas group. It was built in 1846 to control the Gulf of Mexico and Florida Strait. The huge structure was a military mistake, and no troops were stationed in it until the Civil War. In 1863 it became a military prison. Dr. Samuel A. Mudd, who set

the broken leg of John Wilkes Booth, was imprisoned here as a conspirator in the assassination of Abraham Lincoln. His heroic services to the sick and dying in a yellow-fever epidemic won his pardon in 1869. The fort was abandoned in 1873 but was temporarily occupied during the Spanish-American War. The surrounding islands are a national bird and turtle refuge. In the waters between Garden Key and the Florida mainland are rich marine gardens.

Fort Laramie N. M., 1938, southeastern Wyoming, 214 acres. From 1834 to 1890 Fort Laramie was associated with western exploration and settlement. Thousands of weary emigrants on the Oregon Trail stopped here at the junction of the Laramie and North Platte rivers to rest and replenish their supplies. The Pony Express riders paused in a whirl of dust to change horses. Stagecoaches jangled in with mail and passengers. Friendly Indians camped outside the stockade and wandered at will through the enclosure. Such famous scouts as Kit Carson, Jim Bridger, and "Buffalo Bill" enjoyed its hospitality. Other famous visitors of bygone days were Francis Parkman, the historian, and Capt. Benjamin Bonneville and Gen. John C. Fremont, soldiers and explorers. The fort was established as a fur-trading post in 1834. The Federal government purchased it in 1849, and for 40 years it was the only representative of law and order in a vast Indian country. Uprisings were quelled by its soldiers, and several important Indian treaties were signed here.

Fort McHenry National Monument and Historic Shrine, 1924, Maryland, 48 acres. A fort built on an island in Baltimore harbor in 1799. Its bombardment by the British fleet Sept. 13, 1814, inspired Francis Scott Key to write the poem "The Star Spangled Banner" (*see* National Songs).

Fort Matanzas N. M., 1924, Florida, 18 acres. A fort erected by the Spanish in 1743 on an island in the Matanzas River. It takes its name, a Spanish word meaning "slaughters," from an incident in the vicinity when the Spanish under Menéndez killed 300 French Huguenots in 1565.

Fort Pulaski N. M., 1924, Georgia, 5,427 acres. A fort on Cockspur Island in the mouth of the Savannah River, built from 1829 to 1847. During the Civil War it was bombarded and seized by Union forces, cutting off Savannah from outside communication. It is one of the best preserved of the chain of brick forts erected for coast defense by the United States during the early 19th century.

Fort Stanwix N. M. Project, 1935, Rome, N. Y. Fort built in 1758 on the Mohawk River to defend the portage to Oneida Lake; now Fort Schuyler.

Fossil Cycad N. M., 1922, southwestern South Dakota, 320 acres. Large deposits of fossil plants, called flowering cycads. These were tree ferns which flourished during the age of dinosaurs. Many of the trunks bear fossilized fruits and flower buds. The area is of interest only to scientists, as the deposits are underground and digging is not permitted. A number of specimens may be seen in the museum at Wind Cave National Park.

General Grant N. P. *See* Kings Canyon N. P., in this article.

George Washington Birthplace N. M., 1930, Virginia, 394 acres. A memorial mansion on the site of George Washington's birthplace, known as Wakefield. It stands on Popes Creek. A mile distant, on Bridges Creek, is the family burial ground and the site of an earlier ancestral home. Although no authentic picture of Wakefield has ever been discovered, enough of the foundations remained to indicate its size and character. It is a typical Virginia plantation house of the 18th century, surrounded by beautiful lawns and gardens. The boxwood hedges, transplanted from the near-by home of Sarah Tayloe Washington, are more than a hundred years old. The bricks of the house, like those of the original, were handmade and burned on the grounds.

Gila Cliff Dwellings N. M., 1907, southwestern New Mexico, 160 acres. Ruins of prehistoric Indian dwellings built into natural cavities in the face of a cliff 150 feet high.

Glacier N. P., 1910, northwestern Montana, 1,538 square miles. Splendid mountains, in whose hollows lie 60 glaciers and 250 forest-rimmed lakes. Going-to-the-Sun Highway is

one of the outstanding scenic roads of the world. It crosses the Continental Divide through Logan Pass at an altitude of 6,654 feet. Tunnels bore through overhanging cliffs, and in the west tunnel two great windows permit thrilling views, once seen only by the birds. Trails for hikers and saddle horses penetrate the remote areas where wild animals are abundant. (See Glacier National Park.)

Glacier Bay N. M., 1925, Alaska, 3,593 square miles. Tide-water glaciers in a lonely setting of magnificent mountain peaks. The Ecological Society of America and the National Geographic Society urged creation of the monument as a unique field for the scientific study of North America's Ice Age. The bay contains at least 11 glaciers, one of which, Muir Glacier, has a surface area of 350 square miles.

Grand Canyon N. M., 1932, north central Arizona, 201,291 acres. Adjoining the Grand Canyon National Park on the western or downstream side, this monument preserves an additional stretch of the magnificent canyon. At Toroweap Point the canyon is 3,000 feet deep and two miles wide. From this point may be seen a giant cinder cone of volcanic origin, known as "Vulcan's Throne."

Grand Canyon N. P., 1919, north central Arizona, 1,008 square miles. Perhaps the most awe-inspiring of the earth's spectacles, an immense canyon carved by the Colorado River. (See Grand Canyon.)

Grand Teton N. P., 1929, northwestern Wyoming, 150 square miles. A superb range of granite peaks, springing a sheer 7,000 feet above the level floor of Jackson Hole. Their grandeur is greatly enhanced by the absence of foothills. Twenty-two peaks rise between 10,000 and nearly 14,000 feet above sea level. The loftiest peak is the Grand Teton, 13,766 feet high.

The range is an impenetrable barrier 40 miles long, extending southward from the southern boundary of Yellowstone National Park to Teton Pass, where it meets the Snake River Range. It is a block mountain which was tilted upward along a "fault line," or line of fracture, in the earth's crust, until its eastern margin stood 10,000 feet high. Subsequent erosion wore away the covering of sedimentary rocks on the face of the block and exposed its crystalline core. Viewed from Jackson Hole, this eastern face is a precipitous wall of granite. From the western side, in Idaho, one sees the gently sloping, unimpressive back of the block, overlaid with the sedimentary and volcanic rocks which still cover the crystalline core.

The national park includes a 27-mile front on the Wyoming side. Small glaciers still linger in the deeper recesses of the range. Exquisite lakes, surrounded by evergreen forests, are strung in a crystal chain along the base of the mountains. Each lake lies at the mouth of a canyon carved by glaciers and is walled in by glacial moraines. Each reflects in its quiet depths the snowy crags towering more than a mile above. Jenny, Leigh, Bradley, Taggart, and Phelps are the largest of the lakes.

Gran Quivira N. M., 1909, central New Mexico, 611 acres. Ruins of an Indian pueblo and a Spanish mission. The mission was built by the Franciscans about the middle of the 17th century. Only a few walls remain.

Great Sand Dunes N. M., 1932, south central Colorado, 46,034 acres. Wind-blown shifting mounds of sand in the San Luis Valley at the foot of the Sangre de Cristo Mountains. Rising in places to nearly a thousand feet, they are among the largest in the world. The prevailing westerly winds drive the sands across the valley into a hook in the mountains, where they pile up in rippled hills of glistening white. The presence of the sand on the margin of a fertile plateau has never been satisfactorily explained.

Great Smoky Mountains N. P., 1930, North Carolina and Tennessee, 715 square miles. The loftiest mountains east of the Black Hills of South Dakota, famous for the diversity and luxuriance of their plant life (see Great Smoky Mountains National Park).

Hawaii N. P., 1916, Territory of Hawaii, 271 square miles. Two active volcanoes, Kilauea and Mauna Loa, on the island of Hawaii, and the dormant volcano Haleakala on the

island of Maui. The vast fire pit of Kilauea, 4,000 feet above the sea, is the most spectacular and accessible part of the park. It may be viewed from the Volcano House Hotel on its rim. In the Kilauea area is an oasis of about 100 acres which has escaped the encircling lava flows. About 40 species of tropical trees flourish in this beautiful natural park and it harbors many rare native birds.

The crater of Mauna Loa, 13,680 feet above the Pacific Ocean, may be reached by trail from Kilauea, a three-day journey. Rest houses have been built along the way.

Haleakala, on Maui, is 10,032 feet high. It was once much higher, but its dome has collapsed, forming a great crater about 20 miles in circumference. Its floor, 3,000 feet below the rim, is covered with red, black, and orange cinder cones hundreds of feet high. There are about 30 miles of trails within the crater. A paved automobile highway to the crater rim extends up the eastern slope of the volcano through a dense rain forest and fern jungle.

Holy Cross N. M., 1929, central Colorado, 1,392 acres. A white cross formed by two snow-filled crevices on the slopes of the Mount of the Holy Cross. The upright of the cross is 1,500 feet long, and the arms extend about 750 feet on each side.

Homestead National Monument of America, 1939, southeastern Nebraska, 161 acres. The first homestead in the United States, entered by Daniel Freeman under the General Homestead Act of 1862 which opened the West to free settlement.

Hot Springs N. P., 1921, central Arkansas, 1.5 square miles. Hot mineral springs, 47 in number, of medicinal value, and government-regulated bathhouses, in the city of Hot Springs. The springs have been under federal control since 1832. (See Arkansas.)

Hovenweep N. M., 1923, southern Utah and Colorado, 286 acres. Four groups of prehistoric towers, pueblos, and cliff dwellings in the remote canyons and high on the cliffs and plateau. They have been unoccupied for at least 600 years. The towers have been variously explained as temples, forts, or storage bins. Some were built on the edges of cliffs where they might have served as lookout towers. Others are in the bottom of the canyons. Still others were built directly over *kivas*, or underground ceremonial chambers. The name of the monument means "deserted valley."

Isle Royale N. P., 1940, western Lake Superior, 209 square miles. An island wilderness, 50 miles northwest of the Keweenaw Peninsula of Michigan. It is the largest island in Lake Superior, about 45 miles long and nine miles wide. The shoreline is steep and rocky, its cliffs broken by narrow coves and deep harbors. Rock ridges, from 300 to 800 feet high, stripe the island from north to south. In the valleys between lie many lakes. Beautiful evergreen and hardwood forests harbor one of the largest moose herds in North America. There are no roads. The copper of Isle Royale was prized by the prehistoric Indians. Ancient mines may be seen, and ornaments made of the Isle Royale ore have been uncovered in burial mounds from the Atlantic coast to the Rocky Mountains and southward into Mexico.

Jackson Hole N. M., 1943, northwestern Wyoming, 221,610 acres. Area of scenic and historic interest on east and north boundaries of Grand Teton N.P. Embraces Jackson Lake.

Jewel Cave N. M., 1908, southwestern South Dakota, 1,275 acres. Underground chambers and galleries encrusted with beautiful calcite crystals.

Joshua Tree N. M., 1936, southern California, 837,480 acres. A desert area at the foot of the Little San Bernardino Mountains, set aside primarily to save the rare Joshua Tree from extinction. *Yucca brevifolia* is the scientific name of the plant, which belongs to the lily family. It attains a height of 10 to 30 feet. In the spring it bears greenish-white blossoms in clusters from 8 to 14 inches long.

Katmai N. M., 1918, Alaska, 4,215 square miles. A spectacular area of dying volcanic activity, with magnificent lake and mountain scenery. It includes the Valley of Ten Thousand Smokes, created in 1912 by a violent eruption of Mount Katmai which blew millions of holes through the floor

of the valley at its feet. From the holes, or fumaroles, columns of steam rise from 500 to 1,000 feet, merging above in a vast cloud. Brilliantly colored muds surround the fumaroles. The explosion blew off the top of Mount Katmai, leaving a crater 3,700 feet deep and 8.4 miles in circumference. Within five miles of the valley are heavy forests which were not injured by the eruption.

Kings Canyon N. P., 1940, east central California, 710 square miles. A glorious wilderness in the Sierra Nevada, between Sequoia and Yosemite national parks. Along the crestline of the park 40 peaks tower to heights greater than 11,000 feet; and ten are more than 14,000 feet. West of this snowy rampart, on the lower shoulders of the range, are glacier-carved valleys that rival Yosemite in the height of their granite walls. Lovely flower-strewn meadows, hundreds of lakes, the headwaters of countless rushing streams, two great canyons cut by the Kings River, and magnificent forests make this one of the most beautiful of all the parks.

The former General Grant National Park, with its two groves of Big Trees (*Sequoia gigantea*) is now a part of the park. The General Grant Tree is 267 feet high and 40.3 feet in diameter. The 10,000-acre Redwood Mountain and Redwood Canyon section of the park contains the largest stand of sequoias in existence.

Lassen Volcanic N. P., 1916, northern California, 163 square miles. The only active volcano in the United States proper. Its snowy cone, 10,453 feet above sea level, stands near the southern end of the Cascade Mountains. In the vicinity are many other peaks and cinder cones from 7,000 to 8,000 feet high, lava fields, hot springs, fumaroles or gas vents, boiling lakes, and other evidences of volcanic activity. After a quiescent period of about two hundred years, Lassen erupted several times between 1914 and 1921. From its summit a magnificent panorama unfolds. To the west and southwest spreads the broad Sacramento Valley; to the north looms Mount Shasta; eastward are the Honey Lake Valley and the distant mountains of Nevada; and southward rise the forested slopes of the high Sierra Nevada.

Lava Beds N. M., 1925, northern California, 45,967 acres. Volcanic activity extending over a long period and as recent as five hundred years ago has covered this region with lava and cindery pumice. Flows that look like thick frothy molasses turned to stone are honeycombed with tunnels and caves through which the molten material once flowed. They range from a few feet to several miles in length, and from 10 to 75 feet in height. Where the tunnel roofs have collapsed are serpentine trenches, in places 100 feet deep and 250 feet wide. During the Modoc Indian War of 1872-73, the Modocs established themselves in a natural lava fortress within the present monument boundaries, where they resisted United States troops for five months.

Lehman Caves N. M., 1922, east central Nevada, 640 acres. Large limestone caves with many stalactites.

Mammoth Cave N. P., 1936, Kentucky, 78 square miles. Large caves in the beautiful wooded hill country of southern Kentucky, on the Green River. The ghostly underground lakes and streams, and the vast chambers with their massive stalactites and stalagmites, attract thousands of visitors. More than 175 miles have been explored since the historic Mammoth Cave was discovered in 1799, and new sections are still being opened.

The eight-mile trip through the cave includes such features as the saltpeter vats where gunpowder was made during the War of 1812; the Bottomless Pit; Dead Sea; Echo River; Valley of Flowers; Crystal Lake; and the Frozen Niagara, a cascade of glittering white onyx. The Frozen Niagara section was linked in 1935 with the more familiar part of the cave by a broad avenue, stairs, and ramps.

In 1938 four adventurous guides, in search of eyeless fish on the Roaring River, observed a narrow passageway partially blocked by a large rock. Their curiosity aroused by the possibility of new discoveries, they crawled and burrowed their way into the depths of the earth for many hours. On the second day they came upon a series of large avenues and rooms whose beautiful formations excel anything in the

known portions of the cave. Two rooms are covered with exquisite gypsum flowers. Another room they named the Candy Kitchen for its strangely colored and striped formations, resembling peppermint stick, taffy, and pink honeycomb. The Giant Mushroom and many other oddities promise to make this the most interesting section of the entire cave. Park authorities will spend several years exploring and surveying it before joining it with the other areas open to the public. (See also Cave.)

Meriwether Lewis N. M., 1925, central Tennessee, 300 acres. The burial place of Meriwether Lewis, explorer, and governor of Louisiana Territory. It is near the site of Grinder's Inn on the Natchez Trace, where Captain Lewis was found shot dead in 1809.

Mesa Verde N. P., 1906, southwestern Colorado, 80 square miles. The largest and best-preserved prehistoric cliff dwellings and pueblos in North America. The green table (Spanish *mesa verde*) covered with cedar and piñon trees is 15 miles long and 8 miles wide. On three sides it rises abruptly from 500 to 800 feet above the neighboring valleys. Its south side is gashed with numerous steep-walled canyons which open into the canyon of the Mancos River. In the shelter of large caves eroded in the canyon walls and on the mesa top prehistoric Indians built at least 1,500 community apartment dwellings. The Cliff Palace alone must have housed at least 400 persons in its 200 rooms.

Mesa Verde was occupied by Basket-Makers from about the beginning of the Christian Era to 700. Traces of their earth lodges may still be seen. The more highly developed Pueblo Indians then came in and remained until almost 1300, when drought and failing crops forced them to abandon the region. The oldest house which can be definitely dated by means of tree rings in the roof timbers was built about 1066. On a promontory at the confluence of Cliff and Fewkes canyons stands the Sun Temple, a place of worship, possibly dedicated to the sun. (See also Basket-Makers; Cliff Dwellers; Pueblo Indians.)

Montezuma Castle N. M., 1906, central Arizona, 521 acres. A five-story cliff dwelling of adobe brick built into a natural cave in the face of a cliff, some 80 feet above its base. It is reached by a series of ladders.

Morristown N. H. P., 1933, New Jersey, 1.6 square miles. A strategic point during the American Revolution. It was only 30 miles from British lines on Manhattan and Staten islands. Troops could be quickly dispatched from Morristown northward to West Point, key to the defense of the Hudson Valley and New England, and west and south to the Delaware River and Philadelphia. Throughout the war American troops were stationed here, and Washington spent more time at Morristown than at any other headquarters. The park includes three areas. The Ford Mansion, built in 1774, was occupied by General and Mrs. Washington from December 1779 to June 1780. It has been restored and refurnished as a typical example of a prosperous colonial home. A museum stands on the grounds. Fort Mifflin, on a high ridge overlooking the surrounding country, was built in April 1777, as a refuge for the regiment detailed to guard military stores. At Jockey Hollow, three to four miles southwest of Morristown, the army encamped during the winter of 1779-80. Remains of the barracks and other camp buildings may still be seen. The Wick and Guerin houses in the Hollow have been restored as examples of colonial farmhouses.

Mound City Group N. M., 1923, south central Ohio, 57 acres. Prehistoric Indian mounds, containing altars and human remains (see also Mound-Builders).

Mount McKinley N. P., 1917, south central Alaska, 3,030 square miles. The highest mountain peak in North America, 20,300 feet above sea level. It rises 17,000 feet above timberline and for two-thirds of the way to the summit is snow-covered throughout the year. No other mountain peak in the world rises so high directly from its base. The north and west sides drop abruptly to a treeless plateau, 2,500 to 3,000 feet in altitude, covered with mosses and grasses. Down the south and east slopes flow enormous glaciers. The foothills and valleys are covered with dense forests

of black spruce. Mount Foraker, 17,000 feet high, and many other peaks of the Alaska Range lie within the park boundaries. Caribou, moose, grizzly and brown bears, mountain sheep, and many smaller animals flourish in this wilderness, most of which is still unexplored. A modern hotel accommodates visitors.

Mount Rainier N. P., 1899, west central Washington, 378 square miles. An extinct volcano in the Cascade Range, with a snowy truncated cone 14,408 feet high. From the three-mile crater at its summit glaciers spread down the slopes in all directions like the icy tentacles of a giant octopus. Nisqually Glacier is the best known. Rivers flow from the melting ends of the glaciers; forests and flowery alpine meadows cover the lower slopes. John Muir thus described the flowers for which Mount Rainier is famous: "Above the forests there is a zone of the loveliest flowers . . . so closely planted and luxuriant that it seems as if nature, glad to make an open space between woods so dense and ice so deep, were economizing the precious ground and trying to see how many of her darlings she can get together in one mountain wreath—daisies, anemones, geraniums, columbine, erythroniums, larkspurs, among which we wade knee-deep and waist-deep, the bright corollas in myriads touching petal to petal. All together this is the richest subalpine garden I have ever found, a perfect floral elysium."

Muir Woods N. M., 1908, California, 425 acres. A grove of redwood trees at the foot of Mount Tamalpais, near San Francisco. It is named for John Muir, the naturalist and writer, who was an outstanding campaigner for national parks and forest reserves.

Natural Bridges N. M., 1908, southeastern Utah, 2,740 acres. Three natural bridges of great size and beauty, near the head of White Canyon. The largest is the Augusta, or Sipapu, 223 feet above the stream, with a span 261 feet long and 65 feet thick at the top of the arch. The Caroline or Kachina Bridge and the Edwin or Owachomo Bridge are 205 feet and 108 feet high respectively. These bridges, like the great Rainbow Bridge not many miles distant, were formed by a "meandering" or winding river. Such a river continually wears away the inner side of the loops in its twisting course. Eventually it cuts through the neck of a loop and abandons the old course. In this region a hard capping layer of rock resists erosion while the softer layers beneath are washed away. The cap becomes a bridge beneath which the river pursues its new course. The inside of the old loop stands out as a mesa surrounded by canyons, which are the abandoned course of the river. The bridge connects the mesa with the "mainland" of the plateau. (See also Rainbow Bridge N. M., in this article.)

Navajo N. M., 1909, northeastern Arizona, 360 acres. Three cliff-dwelling ruins in natural caves high on the walls of Laguna and Nitsie canyons. They contained from 100 to 250 rooms each. Inscription House derives its name from the words scratched on one wall "S-hapeiro Ano dom. 1661," probably written by a Spanish explorer or missionary. Tree rings in the beams of the ceilings indicate that these dwellings were built between 1242 and 1286.

Ocmulgee N. M., 1936, Georgia, 683 acres. Remains of burial mounds, ceremonial structures, a council chamber, and dwellings built by prehistoric Indians. The great mass of material excavated from the mounds shows several different cultural levels. The primitive hunting state, the mound-building period, and the advanced culture of the Creeks are all represented. A trading post built between 1690 and 1715 by English traders has also been uncovered.

Old Kasaan N. M., 1916, southeastern Alaska, 38 acres. An abandoned Haida Indian village on Prince of Wales Island. Totem poles, grave houses, monuments, and some of the original framework of the buildings are still standing. The Haida tribe migrated to Alaska from British Columbia. The descendants of the residents of Old Kasaan live at Kasaan village, 12 miles distant, near a salmon cannery which gives them employment.

Olympic N. P., 1938, northwestern Washington, 1,305 square miles. The rain-swept, fog-drenched western slopes of

the Olympic Mountains on the Olympic Peninsula, west of Puget Sound and fronting the Pacific Ocean. Here is the finest remnant of primeval forest in the country. Huge evergreens lift their ancient crowns 300 feet high—Douglas firs, Sitka spruces, red cedars, and western hemlocks, some of them a thousand years old. At their feet a luxuriant jungle matting of ferns, mosses, and lichens envelops rocks and huge decaying logs. Swift rivers and streams slash through canyons across the forest tangle on their way to the sea. As the slopes rise from the warm, wet seacoast to the colder mountain heights they open into flowery alpine meadows studded with lakes. Above loom the snowy glacier-scored peaks dominated by Mount Olympus, 7,915 feet high. This area is the home of the rare Roosevelt elk, named for President Theodore Roosevelt who established Mount Olympus National Monument in 1909. The monument became the nucleus of the park in 1938.

Oregon Caves N. M., 1909, Oregon, 480 acres. Several miles of underground chambers and galleries in the Siskiyou Mountains.

Organ Pipe Cactus N. M., 1937, south central Arizona, 330,687 acres. A sun-scorched, waterless desert on the Mexican border, famous for its rare organ pipe cactus, which grows only in this restricted area. The tubular arms of the plant, growing straight up for 20 or more feet, resemble the pipes of an organ. Desert ironwood and many other unusual plants flourish here. Among its few living creatures are the Gaillard bighorn sheep and the Gila Monster. Father Kino by 1700 had established a road across the desert, known as "El Camino del Diablo" (Devil's Highway). So great were the dangers and hardships of the road that hundreds of explorers, miners, and pioneers lost their lives along the way. It can be traced only intermittently today.

Palm Canyon N. M. Project, 1922, Palm Springs, Calif., 1,600 acres. A beautiful grove of Washington palms, the only palm native to the western United States. The canyon and grove are in the Agua Caliente Indian reservation.

Patrick Henry N. M. Project, 1935, Charlotte County, Va. Patrick Henry's last home, "Red Hill." His grave is in the boxwood-bordered family burying ground.

Perry's Victory and International Peace Memorial N. M., 1936, Ohio, on Lake Erie, 14 acres. A granite shaft 352 feet high, commemorating Oliver Hazard Perry's victory over the British fleet at Put in Bay, Sept. 10, 1813, and the century of peace ensuing between the two nations.

Petrified Forest N. M., 1906, northeastern Arizona, 93,199 acres. Six forests of petrified wood, strewn with sections of tree trunks. There are no standing trees and but few instances of upright trunks and roots. One of the largest logs is the Agate Bridge, four feet in diameter, which spans a 40-foot gully. The monument also includes part of the Painted Desert, an area of brilliantly colored rocks, carved by erosion into a series of southward-facing cliffs, isolated mesas, and deep canyons. It was discovered in 1540 by Coronado, who named it "El Pintado Desierto." (See also Petrified Forests.)

Pinnacles N. M., 1908, west central California, 14,498 acres. Spirelike rock formations which rise from 500 to 1,200 feet above the floors of several canyons, eroded in a volcanic ridge.

Pioneer N. M. Project, 1934, Kentucky. Four areas commemorating the pioneers who settled Kentucky under the leadership of Daniel Boone. Includes the site of Fort Boonesborough (1775); Bryan Station and Boone Station, frontier outposts; and Blue Licks Battlefield, where the settlers were attacked by a band of Indians and British in 1782.

Pipe Spring N. M., 1923, northwestern Arizona, 40 acres. A spring of cold pure water famous in Utah and Arizona history. Brigham Young, president of the Mormon Church, in 1856 sent William Hamblin on a peace mission to the Hopi Indians of Arizona. With his party of ten, he camped by the spring. It received its name when Hamblin, in a contest of marksmanship, shot the bottom out of a pipe without breaking the bowl. The Mormons established a cattle ranch here and built a stone fort around the spring. The presence of

a large spring in this desert country is due to a break, or fault, in the earth's crust. Underground waters draining from the higher plateaus to the north find their way to the surface through this crack. The first telegraph station in Arizona was in the fort, known as "Winsor Castle."

Pipestone N. M., 1937, southwestern Minnesota, 115 acres. Quarries of red stone from which the Indians of ancient and historic times made their peace pipes. Within the monument also are three granite boulders, known as the "Three Maidens," at which many ceremonials were held. The region was considered a sanctuary for all Indians of all tribes. Quarrying of the stone is reserved exclusively to the Indians.

Platt N. P., 1906, southern Oklahoma, 1.4 square miles. Sulphur and bromide springs of medicinal value in a picturesque region of wooded, gently rolling hills.

Rainbow Bridge N. M., 1910, southeastern Utah, 160 acres. The largest known natural bridge in the world, first seen by white men as late as 1909. It lies in one of the wildest and most inaccessible regions in the United States. Even today it can be reached only on horseback, at least two days being required for the round trip. The bridge is a beautifully symmetrical arch of salmon-pink limestone, 309 feet high and 278 feet from pier to pier. It is unusual in having a curved top, like the arch of the rainbow. Fire-blackened stones indicate that prehistoric Indians worshiped here, and modern Indians regard it with religious awe. The sight of its lonely majesty richly rewards those who make the difficult trip. (See also Natural Bridges N. M., in this article.)

Rocky Mountain N. P., 1915, north central Colorado, 405 square miles. Part of the majestic Front Range of the Rocky Mountains. Within the park boundaries 65 peaks rise more than 10,000 feet above sea level, dominated by Longs Peak, 14,255 feet high. The east side drops down from the Continental Divide in sheer precipices from 2,000 to 3,000 feet deep. At the bottom of rock-bound gorges lie wild and lonely lakes. The gentler west side has beautiful flowery valleys, countless streams, and forest-rimmed lakes. The east entrance to the park is the village of Estes Park, from which highways and trails lead to the most spectacular areas. The Trail Ridge Road, across the Continental Divide, reaches a height of 12,183 feet.

Saguaro N. M., 1933, Arizona, 63,284 acres. The giant saguaro cactus, preserved in a tract near Tucson on the slopes of the Santa Catalina Mountains. Some of the plants are more than a hundred years old and reach a height of 50 feet.

Santa Rosa Island N. M., 1939, northern Florida, 9,500 acres. A barrier reef off the mainland from Pensacola, site of an early Spanish settlement which was destroyed by a hurricane in 1754. Swimming facilities are provided on its wide beaches.

Saratoga N. H. P. Project, 1938, New York. Site of General Burgoyne's surrender to General Gates, Oct. 17, 1777; regarded as the turning point in the American Revolution (see Saratoga Springs).

Scotts Bluff N. M., 1919, western Nebraska, 3,476 acres. Famous landmark on the Oregon Trail. The bluff rises nearly 800 feet above the North Platte River. Through Roubidou Pass, and later through Mitchell Pass, labored the covered wagons on their way to the Pacific coast. The Pony Express, the first stage lines, and the first transcontinental telegraph company established stations here.

Sequoia N. P., 1890, east central California, 604 square miles. Forests of Big Trees on the western slopes of the Sierra Nevada. One of the largest and oldest living things in the world is the General Sherman Tree, 272.4 feet high, 36.5 feet in diameter, and perhaps 4,000 years old. Within the park are Mount Whitney, the highest peak in the United States proper (14,495 feet), and Kern Canyon, 3,000 feet deep and 25 miles long. Kings Canyon National Park adjoins Sequoia on the north. (See Sequoia.)

Shenandoah N. P., 1935, northwestern Virginia, 302 square miles. The crest of the Blue Ridge Mountains, extending about 75 miles from Front Royal on the north to Jarman

Gap, near Waynesboro, on the south. The park averages four miles in width. The area is characterized by a high ridge from 3,000 to 4,000 feet above sea level, from which branch sharp spur ridges. Hawksbill Head, 4,049 feet, is the highest point. Between the ridges lie narrow valleys or coves, with rushing streams and waterfalls. Beautiful hardwood forests cover hill and valley. The park is most noted for the panoramic views from the Skyline Drive. Extending the length of the park, this drive is a part of the Blue Ridge Parkway between Shenandoah and Great Smoky Mountains national parks. To the east stretch the farmlands of the Piedmont Plain. On the west lies the Shenandoah Valley, from 20 to 25 miles wide, through which the Shenandoah River winds on its way north to join the Potomac. Massanutten Mountain, a group of long, low ridges, crosses the valley to the north, and in the distant west rise the Allegheny Mountains.

Shoshone Cavern N. M., 1909, northwestern Wyoming, 212 acres. A cave near the summit of Cedar Mountain. Its walls are encrusted with crystals and drip formations, but there are no large stalactites or stalagmites. The descent by ladders is perilous and the monument has been closed to visitors.

Sitka N. M., 1910, southeastern Alaska, 57 acres. Site of an ancient village of warlike Indians. They were subdued here by the Russians in 1804. Sixteen totem poles collected from different points on Prince of Wales Island are the principal objects of interest.

Statue of Liberty N. M., 1924, New York City, 10 acres. A great copper statue of 'Liberty Enlightening the World', on Bedloe's Island. (See Liberty, Statue of.)

Sunset Crater N. M., 1930, north central Arizona, 3,040 acres. An area of comparatively recent volcanic activity. Sunset Mountain is an extinct volcano rising 1,000 feet above the surrounding country. Its crater is rimmed with bright-yellow sulphur, shading down into bands of orange, red, and finally black volcanic ash, which give it the appearance of a sunset glow. The region is fantastically marked by lava flows hundreds of feet deep; fumaroles, or holes in the lava from which gases escaped; and cinder cones—all entirely without soil or vegetation. In the lava beds are numerous ice caves. Near by are the lofty San Francisco Peaks, also extinct volcanoes.

Timpanogos Cave N. M., 1922, north central Utah, 250 acres. Three limestone caverns on the northern slope of Mount Timpanogos in the Wasatch Range. They are reached by a steep trail up the wall of American Fork Canyon. The caves were washed out by American Fork Creek along the lines of a fault, or breakage, in the mountain which occurred, geologists say, some 50 million years ago. After creating the caves the stream carved out the canyon which lies below.

Tonto N. M., 1907, south central Arizona, 1,120 acres. Two cliff dwellings built in the 14th century but showing signs of recent Indian occupancy. They are structures of adobe, two and three stories high, built into caves in the face of a cliff. The supporting beams, window frames, and low doors are still in place.

Tumacacori N. M., 1908, southern Arizona, 10 acres. The Spanish mission of San José de Tumacacori, founded by Father Eusebio Kino, Jesuit missionary, about 1690. It was taken over by the Franciscans in 1769. The date of the present building is uncertain. A small chapel stood on the site until 1730, when a new building was erected. This was attacked and destroyed by Apaches in 1769; repaired, and again damaged in 1800. Once more it was rebuilt and dedicated in 1822. Soon afterward it was abandoned, when the Franciscans were expelled from Mexico. The ruins consist of the walls and tower of the church building, the walls of a mortuary chamber, and a courtyard surrounded by adobe walls.

Tuzigoot N. M., 1939, Arizona, 43 acres. An ancient pueblo on a ridge above the Verde River, occupied from about 1000 to 1400 by three different cultural groups. They apparently lived here simultaneously. From the floors of the rooms and from hundreds of burials, scientists have recovered pottery vessels; bone, horn, and stone implements; basketry, matting, and jewelry.

Verendrye N. M., 1917, northwestern North Dakota, 253 acres. The place on the bank of the upper Missouri River where François and Louis Joseph de la Vérendrye camped during their explorations in 1742. With their famous father, Pierre Gaultier de Varennes, Sieur de la Vérendrye, they were the first white men to explore the interior of the Northwest.

Walnut Canyon N. M., 1915, north central Arizona, 1,879 acres. About 300 cliff houses built under the sloping walls of Walnut Canyon. Unlike the communal type, these dwellings of from six to eight rooms each seem to have been intended for separate families. They were occupied from about 900 to 1100. Water was carried from the canyon bottom along trails which may still be traced.

Wheeler N. M., 1908, southwestern Colorado, 300 acres. Volcanic outpourings of ages past, eroded into gorges and pinnacles of strange beauty. The area is approached by horseback trail through a spruce forest. At the edge of the forest one is suddenly confronted by a maze of canyons. It is virtually impossible to cross the monument on foot or horseback.

White Sands N. M., 1933, south central New Mexico, 144,946 acres. Dazzling white gypsum crystals piled into high dunes resembling snowdrifts. Gypsum in solution is washed down from the mountains on to alkali flats, where the crystals are deposited by evaporation of the water. Some of it is derived from water pushing upward through underground beds of gypsum and evaporating at the surface.

Whitman N. M., 1940, Washington, 46 acres. Site of an Indian mission and school, near Walla Walla; established in 1836 by Marcus Whitman and his wife (see Whitman, Marcus).

Wind Cave N. P., 1903, southwestern South Dakota, 20 square miles. A large cavern in the Black Hills, notable for its unique boxwork or frostwork formations. The boxwork is composed of delicately colored crystals in honeycomb pattern, deposited by evaporating water along countless cracks in the cave walls and roofs. There are few stalactites or stalagmites. Strong currents of air blowing in or out of the cavern's mouth suggested its name. Changes in the atmospheric pressure outside cause the winds. A wild game preserve within the park area harbors bison, antelope, elk, and deer.

Wupatki N. M., 1924, north central Arizona, 35,813 acres. Pueblo ruins overlooking the Painted Desert. They were occupied from the 11th to the 13th centuries by peoples who are believed to be the ancestors of the modern Hopi Indians.

Yellowstone N. P., 1872, northwestern Wyoming and parts of Montana and Idaho, 3,472 square miles. A volcanic region famous for its geysers and hot springs, its boiling clay pools and steaming rivers. An exquisitely colored canyon with plunging waterfalls, the beautiful Yellowstone Lake, petrified forests, and matchless mountain scenery make it an area of the most varied interest. The best known of its attractions may be visited by automobile or bus over fine highways, but nine-tenths of the park is a primeval wilderness inaccessible even by trail. As late as 1940 a new area of hot springs was discovered. (See Yellowstone National Park.)

Yosemite N. P., 1890, east central California, 1,189 square miles. The famous Yosemite Valley (see Yosemite Valley) is a small part of this spectacular wilderness in the Sierra Nevada. The beautiful Hetch Hetchy Valley, Tuolumne Canyon, Lee Vining Canyon, the groves of Big Trees (sequoias) and sugar pines, and the magnificent Tioga Pass Road over the crest of the mountains are all equally remarkable.

Yucca House N. M., 1919, southwestern Colorado, 10 acres. Ruins of a prehistoric Indian village, most of it still buried in great mounds of earth.

Zion N. M., 1937, southwestern Utah, 49,150 acres. On the western border of Zion National Park; an area which contains the Kolob canyons. They have been cut by stream erosion into the face of the 3,000-foot Hurricane Cliffs. The red walls of the eight canyons are from 1,500 to 2,500 feet high. The region can be visited only on horseback.

Zion N. P., 1919, southwestern Utah, 135 square miles. A beautiful canyon cut by the Virgin River into the Vermil-

ion and White Cliffs, which stretch across the plateau country of southern Utah. It is entered between two great blocks of stone, the West Temple, 3,805 feet above the valley floor, and The Watchman, 2,713 feet high. Beyond this impressive gateway the visitor finds himself in a canyon, a mile wide from rim to rim and half a mile wide at the bottom, with perpendicular walls half a mile high. The lower walls are mauve and purple shales. Above them lie rocks of vermilion red, topped by dazzling white. Against the east wall of the canyon stands a noble mass called the Great White Throne, a flat-topped dome towering 2,447 feet above the river. In vivid contrast to the Throne is the dull red of the Angels Landing (1,425 feet) directly opposite. The automobile highway ends in a great parklike amphitheater, the Temple of Sinawava. Beyond, a trail leads to The Narrows, where the canyon is 2,000 feet high and only 50 feet wide. From the top of Lady Mountain, reached by a trail, one obtains a magnificent view of the valley far below and the surrounding plateau beyond the rim. The Zion-Mount Carmel Highway crosses the southern part of the park. A Mormon scout discovered Zion Canyon in 1858. Mormon settlers grazed stock and farmed in it until 1909, when it was made a national monument.

Recreational Areas

There are two Recreational Areas, reserved, as the name indicates, for their recreational attractions:

Boulder Dam National Recreational Area, 1936, Arizona and Nevada, 2,715 square miles. Lake Mead, created by Boulder Dam, and the surrounding area of mountains, canyons, and desert provide varied facilities for sports of all kinds. The area is administered in cooperation with the Bureau of Reclamation which has jurisdiction over the dam.

Cape Hatteras National Seashore Recreational Area Project, 1937, North Carolina, 98 square miles. Bathing beaches on Atlantic Ocean. The area includes such historic spots as Kill Devil Hill, now a national memorial; Fort Raleigh on Roanoke Island, from which the "lost colony" disappeared in 1591 (see North Carolina); Ocracoke Island, haunt of the pirate Blackbeard; and Cape Hatteras, the "graveyard of the Atlantic," whose shores are strewn with wrecked ships.

Miscellaneous Memorials

The National Park system also administers the following memorials: Lee Mansion, in Virginia, on the bank of the Potomac River across from Washington, home of Robert E. Lee; Washington Monument, the Lincoln Memorial, the house in which Lincoln died, and the Lincoln Museum, all in Washington, D. C.; Kill Devil Hill, Kitty Hawk, N. C., where the Wright brothers made the first sustained flight by airplane; Camp Blount Tablets, in Tennessee, site of Andrew Jackson's mobilization in 1813 against the Creek Indians; New Echota, Ga., site of the last Cherokee capital; and Mount Rushmore (see South Dakota).

The old Chesapeake and Ohio Canal, abandoned in 1924, was purchased by the government in 1938. The National Park Service is restoring a 22-mile section between Georgetown, D. C., and Seneca, Md. (see Canals). The area is classified as one of the National Capital parks, all of which are under National Park jurisdiction.

National parkways are being developed along motor highways of unusual scenic and historic interest. Mount Vernon Parkway follows the Potomac River, linking Washington, D. C., with Mount Vernon. It is a part of the George Washington Memorial Parkway on the Maryland and Virginia shore of the Potomac. The Blue Ridge Parkway joins the Shenandoah

and the Great Smoky Mountains national parks. The most spectacular part of it is the Skyline Drive on the crest of the Blue Ridge Mountains through Shenandoah National Park. The Natchez Trace follows the old Indian trail between Natchez, Miss., and Nashville, Tenn. Oglethorpe National Trail and Parkway, to be established between Savannah and Augusta, Ga., will follow the route of an ancient Indian trail prominent in the history of the Southeast.

Battlefield Sites, Cemeteries, Military Parks

National Battlefield Sites administered by the National Park Service are Antietam, Md.; Kennesaw Mountain, Ga.; Tupelo and Brices Cross Roads, Miss.; Fort Necessity, Pa.; White Plains, N. Y.; and Cowpens, S. C. The last three commemorate Revolutionary battles; the others, battles of the Civil War. Eutaw Springs, S. C., scene of a Revolutionary battle, is a Battlefield Site Project.

National Cemeteries are maintained at Antietam, Md.; Battleground, District of Columbia; Chattanooga, Fort Donelson, Shiloh, and Stones River, Tenn.; Fredericksburg, Poplar Grove, and Yorktown, Va.; Gettysburg, Pa.; Vicksburg, Miss.; and Custer Battlefield, Mont.

The National Military Parks embracing Civil War sites are Chickamauga and Chattanooga in Georgia and Tennessee; Gettysburg, Pa.; Vicksburg, Miss.; Fredericksburg and Spotsylvania County Battlefields Memorial, and Petersburg, Va.; Shiloh, Stones River, and Fort Donelson, Tenn. The military parks memorializing Revolutionary battles are Moores Creek and Guilford Courthouse, N. C.; and Kings Mountain, S. C. Military park projects include Kennesaw Mountain, Ga., Monocacy, Md., and Richmond, Va., Civil War sites.

National Forests and Wilderness Areas

Besides the areas administered by the National Park Service, there are many other publicly owned areas in which the people of the United States may find recreation. National forests, which cover many times the area of the national parks, were created by the United States government primarily to protect the nation's lumbering and grazing resources. Hunting is permitted in season in the forests, though never in the parks. (See Forests and Forest Protection.)

Wilderness areas were first set aside in 1937 on Indian reservations and in the national forests. They are held for the government by the Forest Service and the Indian Bureau. Each wilderness area contains at least 100,000 acres. There are no improvements, except the simplest trails. There are no roads, no hotels, no camps. In these romantic regions the traveler may enjoy the thrills and hardships of an exploring Coronado, the adventure and excitement of the gold seeker and fur trader. Here the life of pioneer America is re-created.

To provide experienced leadership for journeys into these last strongholds of nature, the American Forestry Association has formed an organization called the Trail Riders of the Wilderness. Each expedition

of about 25 persons is accompanied by a physician, a forest ranger, and a botanist. Expert guides, packers, wranglers, and cooks are hired. Expenses are shared on a nonprofit basis.

State and Local Parks

Another duty of the National Park Service is to aid in the development of state, county, and municipal parks. The Civilian Conservation Corps cooperated from 1933 to 1943 by constructing buildings, cutting firebreaks and trails, cleaning up underbrush, and controlling erosion, plant diseases, and insects.

Among the older state parks the Adirondack Forest Preserve in New York is one of the largest, covering over two million acres. The Catskill Forest Preserve in New York contains 224,000 acres. Custer State Park in the Black Hills of South Dakota covers 128,000 acres. The Dunes State Park, a 2,200-acre park in Indiana, on the shore of Lake Michigan, is within easy reach of 12,000,000 people living in the Chicago region.

County and municipal parks on the fringes of large cities are growing rapidly. The Cook County Forest Preserves provide Chicago's millions with over 30,000 acres of wooded picnic grounds and trails for hiking and riding. The Long Island and Westchester parks near New York City total about 28,000 acres. Phoenix, Ariz., has an out-of-the-city park of over 14,000 acres, and Denver's parks cover nearly 13,000 acres.

The National Park Service is also in charge of recreational demonstration areas. These are situated near large centers of population on land which is unsuited to any economic use. They are being developed primarily for organized camping for low-income groups who cannot travel to distant state or national parks. Eventually most of them will be turned over to the states for administration.

Public interest in outdoor recreation has developed faster than the facilities to accommodate the growing numbers of picnickers, campers, and hikers. In 1936 Congress authorized the Park, Parkway, and Recreational-Area Study to inventory existing areas. On this study will be based a national plan for the future recreational requirements of the entire country.

National Parks of Canada

Canada has followed the lead of the United States in preserving its glorious scenery and historic sites. Following are its national parks:

Banff, 1885, Alberta, 2,585 square miles; includes town of Banff, Lake Louise, and Mount Assiniboine (nearly 12,000 feet high); game sanctuary; connected by scenic highways with parks to the north and west.

Buffalo, 1908, Alberta, 197.5 square miles; fenced enclosure, home of buffalo and other large animals.

Cape Breton Highlands, 1936, Nova Scotia, 390 square miles; rugged coast line with mountain background; beautiful sea views from motor highway; picturesque fishing villages near by.

Elk Island, 1911, Alberta, 51 square miles; fenced enclosure sheltering buffalo, moose, elk, and deer.

Fort Anne, 1917, Nova Scotia, 31 acres; site of early Acadian settlement of Port Royal.

Fort Beauséjour, 1926, New Brunswick, 59 acres; site of old French fort.

Georgian Bay Islands, 1929, Ontario, 5 square miles; island reservations in scenic Georgian Bay.

Glacier, 1886, British Columbia, 521 square miles; magnificent scenery in Selkirk Mountains.

Jasper, 1907, Alberta, 4,200 square miles; immense mountain wilderness, much of it unexplored; Mount Edith Cavell and Angel Glacier; Athabaska River Valley, route of the historic Athabaska Trail to west coast; big game sanctuary.

Kootenay, 1920, British Columbia, 587 square miles; highway park, extending five miles on each side of 63-mile section of Banff-Windermere Highway.

Mount Revelstoke, 1914, British Columbia, 100 square miles; alpine plateau formed by summit of mountain, on west slope of Selkirk Mountains; reached by spectacular highway.

Nemiskam, 1922, Alberta, 8.5 square miles; fenced reserve for pronghorned antelope.

Point Pelee, 1918, Ontario, 6 square miles; most southerly point of Canada, on Lake Erie; fine beaches; migratory bird sanctuary; unique flora.

Prince Albert, 1927, Saskatchewan, 1,869 square miles; forested wilderness, many connected lakes, and streams affording canoe routes for hundreds of miles; water gateway to far north.

Prince Edward Island, 1936, 7 square miles; coast-line strip on north shore of Prince Edward Island.

Riding Mountain, 1929, Manitoba, 1,148 square miles; rolling woodland country with beautiful lakes; game sanctuary.

St. Lawrence Islands, 1914, Ontario, 186 acres; mainland area and several of the Thousand Islands in the St. Lawrence River.

Waterton Lakes, 1895, Alberta, 220 square miles; Canadian section of Waterton-Glacier International Peace Park.

Yoho, 1886, British Columbia, 507 square miles; on west slope of Rocky Mountains; famed Yoho Valley with waterfalls 1,200 feet high, and beautiful Kicking Horse Valley.

Some of Canada's provincial parks are larger than the national areas. Algonquin Park in Ontario covers 2,740 square miles; Laurentides Park in Quebec contains 3,565 square miles; and Tweedsmuir Park in British Columbia contains 5,400 square miles. Wood Buffalo Park in northern Alberta and the Northwest Territories is a great animal reserve covering 17,300 square miles of forest and lake.

Similar Parks in Many Lands

The largest park developments in other countries have been made in the more recently settled parts of the world. Alarmed by the steady disappearance of big game, African governments have set aside a large number of wild-animal sanctuaries. The wonderful Albert National Park in the Belgian Congo was reserved by King Albert of Belgium in 1925 at the suggestion of the American explorer Carl Akeley, to protect the gorilla and other rare animals that inhabit it. It covers more than 3,000 square miles. The Union of South Africa in 1926 established Kruger National Park, a big-game reserve of 8,800 square miles. The tremendous Etosha Reserve of 27,600 square miles in Southwest Africa and the Bontebok, Kalahari Gemsbok, Addo Elephant, Mountain Zebra, and Bamingui national parks all protect animals threatened with extinction.

Australia has numerous parks to protect its unique native animals. In New Zealand are the scenic Tongariro, Mount Egmont, and Sounds parks. In India, Asiatic animals find sanctuary in the Hailey National Park of 126 square miles in the foothills of the Himalayas. Krakatoa in the Netherlands Indies, scene

of the greatest volcanic eruption of modern times, has been reserved for biological and geographical studies. Japan in 1919 decreed a law "for the preservation of scenery and of historical and nature monuments," and now has several hundred such monuments.

Latin American nations have set aside some of their most interesting areas in recent years to save them from exploitation. The Galápagos Islands were declared a national park by Ecuador in 1936, and research stations were established to study their plant and animal life. Easter Island (*see* Easter Island) and the Juan Fernandez Islands (*see* Crusoe, Robinson) are national parks owned by Chile. Argentina's Nahuel Huapi includes in its two million acres a number of exquisite lakes in the foothills of the Andes Mountains; and the Iguassú National Park, on the Argentine-Brazilian boundary, contains one of the world's greatest waterfalls. The Organ Mountains National Park of Brazil, near Rio de Janeiro, was created in 1939. Mexico has several national parks, including the Cacahuamilpa Caves in the state of Guerrero; the mountain peak known as Volcan Nevado de Colima, in Colima; Cerro de Garnica, a mountain in Michoacan; and El Potosí, a wild-flower and wild-life reserve in the state of San Luis Potosí.

In October 1940, six Latin American republics and the United States signed the Pan American convention on "Nature Protection and Wild Life Preservation in the Western Hemisphere." Cuba, El Salvador, Nicaragua, Peru, Venezuela, and the Dominican Republic agreed to create national parks, wilderness reserves, and wild-life sanctuaries in their territories. The governments pledged themselves to preserve natural scenery, striking geological formations, and objects of esthetic, scientific, or historic interest.

The parks of Europe are few, and most of them are small. In the British Isles property is being acquired and administered by the National Trust for Places of Historic Interest or Natural Beauty and by the Royal Society for the Promotion of Nature Reserves in the British Isles. Argyll National Forest Park in Scotland embraces about 100 square miles of beautiful Highland scenery and the wonderful gardens of the former Benmore estate.

Russia's Kuban Park in the northwestern Caucasus is a wild mountainous area with large sections of virgin forest and fragrant alpine meadows inhabited by ibex and chamois. The Swiss National Park embraces 58 square miles in the wildest and most rugged part of the eastern Alps. Italy's Gran Paradiso Park in the high Alps covers 290 square miles. Stelvio Park, also in the Alps, harbors ibex, chamois, and other animals in its woodlands. The Abruzzi Park, in the central part of the peninsula, is notable for its forests, flowers, and animal life. France's largest park is the Pelvoux (100 square miles) in the Alps near Grenoble. The Camargue (60 square miles) is in the Rhone delta, where the shallow ponds attract multitudes of water fowl and other migratory birds. Germany has many forested game reserves and "nature monuments."

HYMNS that FIRE the Hearts of NATIONS

The Spirit of a People Expressed in their Songs—Origin of the Famous 'Marseillaise'—How England's National Anthem is Echoed in Other Lands—'The Star-Spangled Banner' and the 'Battle Hymn of the Republic'

NATIONAL SONGS. In every nation some tune is closely associated with the love of the people for their country. It moves them like the rippling folds of a waving flag, or the face of a loved ruler. To its patriotic words the national anthem adds the appeal of stirring music. Children chanting its verses feel a deep loyalty they but dimly understand. Its strains rouse men far more quickly than the most passionate orations.

The best loved national songs have arisen in time of crisis. Francis Scott Key wrote 'The Star-Spangled Banner' during the bombardment of Fort McHenry, near Baltimore, in the War of 1812. Rouget de Lisle called fellow citizens to arms with the ringing phrases of the 'Marseillaise' during the French Revolution. 'The Wearing of the Green' was the outcry of the Irish rebellion of 1798, when the display of the shamrock emblem was forbidden.

Francis Scott Key, a young lawyer, sailed down Chesapeake Bay early in September 1814 to plead for the release of a friend who was held prisoner aboard a British warship. The British freed his friend, but detained both him and Key until after their surprise attack on Baltimore. They towed the American's small vessel, the *Minden*, to a mooring in Baltimore harbor. Key watched the bombardment from its deck, guarded by British marines. All day on September 13, the battle raged, and through the night. Key paints a picture of that crucial night, as he strained his eyes for a glimpse of the flag he called "the Star-Spangled Banner" floating from the ramparts at Fort McHenry.

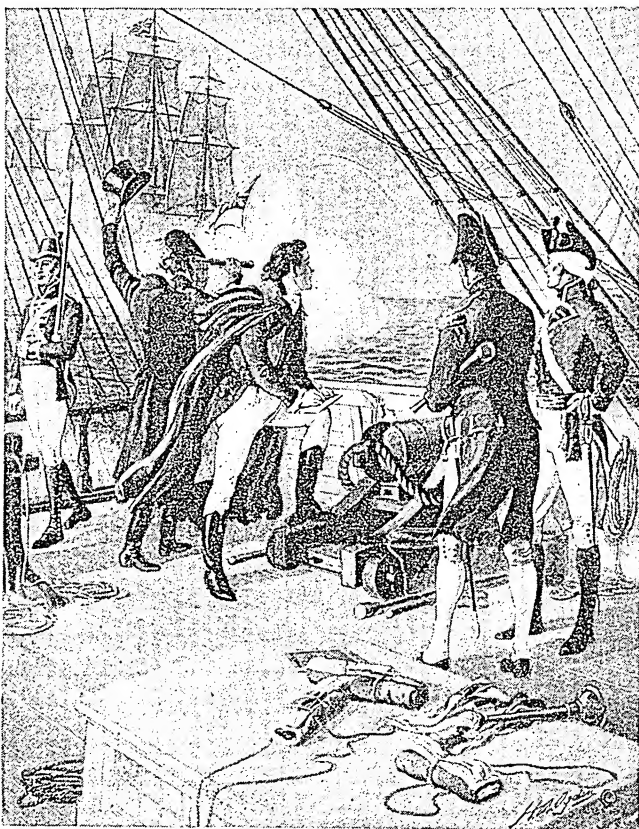
The poem quickly became popular, and was set to the music of an old Revolutionary song, 'Adams and Liberty', taken in turn from an English air, 'Anacreon in Heaven'. Many generations of school children had

risen to honor this patriotic song before Congress officially recognized it as the national anthem of the United States in March 1931.

The tune of 'America', whose words were written by the Rev. Samuel F. Smith in 1832, has been the most popular of all patriotic airs. Eleven countries have set verses to this music. To its stately rhythm is sung 'God Save the King', Great Britain's national anthem. The air goes back to an early Saxon folk-song.

A rollicking jig-tune whose age gives it standing among America's national songs is 'Yankee Doodle'.

PROOF THAT "THE FLAG IS STILL THERE"



During the bombardment of Fort McHenry—that anxious night of "the rockets' red glare"—Francis Scott Key, held by the British in Baltimore harbor, wrote the words of 'The Star-Spangled Banner' on the back of an old letter. This painting by H. A. Ogden shows the scene.

This is the only war song of Revolutionary days that is still commonly sung today. Its homely rhymes mock the crude manners and costumes of the raw and ill-equipped American troops. The tune is far older than the words we know, for more than a century earlier verses had been sung to it ridiculing the Cavalier troops of Charles I. Soldiers of the North in the Civil War and members of the American Expeditionary Forces during the first World War took their nickname, "Yanks," from its title.

'Hail Columbia', written by Joseph Hopkinson in 1798, is almost as old as the nation. Its tune came from 'The President's March' composed by Philip Phyllo in honor of George Washington. 'Columbia, the Gem of the Ocean' is generally attributed to Thomas

à Becket, an English actor who was in Philadelphia in 1843. A British version of the hymn is 'Britannia, the Pride of the Ocean'.

Some of the most inspiring American patriotic songs sprang from the turmoil of the Civil War. Julia Ward Howe's stirring 'Battle Hymn of the Republic' and George F. Root's 'The Battle Cry of Freedom' combine lofty sentiments with rousing marching tunes.

Other popular Union marching songs were 'John Brown's Body' and 'Marching Through Georgia', by H. C. Work. Though 'Dixie', by Daniel D. Emmett, originated in the North as a negro minstrel song in 1859, it came to be the rallying song of the Confederate cause. Another popular Southern lyric was 'Maryland, My Maryland', by James Ryder Randall, sung to the melody of the German Christmas song, 'Tannenbaum'.

The Spanish-American War revived 'When Johnny Comes Marching Home', written during the Civil War by Patrick S. Gilmore, under the pen name Louis Lambert. Other favorites of that war were chiefly popular music hall tunes, long since forgotten. So often did military bands play 'There'll be a Hot Time in the Old Town Tonight' that Cuban natives thought it was the American national anthem.

In the World War of 1914-1918 many new songs appeared. Singing was recognized as a valuable aid to morale, and song leaders were in every camp of American soldiers.

The new songs ranged from humorous and sentimental ballads to stirring march airs that rang with the tramp of feet along French highways. Civilians in England and the United States echoed soldier voices with 'It's a Long, Long Way to Tipperary', 'Keep the Home Fires Burning', 'Pack Up Your Troubles in Your Old Kit Bag', 'Over There', 'K-K-K-Katy', 'There's a Long, Long Trail', 'Smiles', and many more.

War Songs of the Allies

During this war America became better acquainted with the national anthems of allied lands. Students learned the words, and audiences rose as bands played

AMERICA

*My country, 'tis of thee,
Sweet land of liberty,
Of thee I sing;
Land where my fathers died,
Land of the Pilgrims' pride,
From every mountain side
Let freedom ring.*

*My native country, thee—
Land of the noble free—
Thy name I love;
I love thy rocks and rills,
Thy woods and templed hills;
My heart with rapture thrills
Like that above.*

*Let music swell the breeze,
And ring from all the trees
Sweet freedom's song;
Let mortal tongues awake,
Let all that breathe partake,
Let rocks their silence break,
The sound prolong.*

*Our fathers' God, to Thee,
Author of liberty,
To Thee we sing:
Long may our land be bright
With freedom's holy light,
Protect us by Thy might,
Great God, our King.*

the airs. 'La Marseillaise', France's flaming anthem, always aroused enthusiasm. More familiar grew the British patriotic hymns: 'God Save the King', by Henry Carey; 'Rule Britannia!', by J. Thomson and Dr. Thomas A. Arne; 'The Maple Leaf Forever', of Canada, by A. Muir; 'The Song of Australia', with words by Mrs. C. J. Carleton and music by Carl Linger; the Irish 'Wearin' o' the Green'; the Scottish 'Scots Wha Hae wi' Wallace Bled' and 'We'll Hae Nane but Highland Bonnets Here', and the Welsh 'Men of Harlech'.

Belgium's 'La Brabançonne' had appeared during a previous life-struggle of this battle-scarred nation—the war that freed her from Dutch rule. The verses were written by Jenneval and set to music by François van Campenhout.

Postwar Europe saw many changes in national songs as well as in governments. To the Italian national air, 'The Royal March', by G. Gabetti, was added the Fascist hymn, 'Giovinezza'. Mussolini restricted the playing of the national

air to a few holidays so its appeal would not be dulled. 'Garibaldi's Hymn' by Luigi Mercantini, music by Alessio Olivieri, is another favorite in Italy.

The Austrian republic abandoned the national anthem of the empire, 'Gott Erhalte Unsern Kaiser' (God Preserve Our Emperor) sung to music by Franz Joseph Haydn. The various parties in power before Austria's annexation to Germany tried to establish a successor. One favorite was 'Oesterreichische Bundes-hymne', with words by Karl Renner and music by Wilhelm Kienzl. The national anthem of the Hungarians is 'Magyar Himnusz' (Hungarian Hymn).

THE STAR-SPANGLED BANNER

*O say, can you see, by the dawn's early light,
What so proudly we hail'd at the twilight's last gleaming?
Whose broad stripes and bright stars, through the perilous fight,
O'er the ramparts we watch'd, were so gallantly streaming!
And the rocket's red glare, the bombs bursting in air,
Gave proof through the night that our flag was still there:
O say, does that star-spangled banner yet wave
O'er the land of the free and the home of the brave?*

*On the shore, dimly seen through the mists of the deep,
Where the foe's haughty host in dread silence reposes,
What is that which the breeze, o'er the towering steep
As it fitfully blows, now conceals, now discloses?
Now it catches the gleam of the morning's first beam,
In full glory reflected now shines on the stream:
'Tis the star-spangled banner! O long may it wave,
O'er the land of the free and the home of the brave!*

*And where is that band who so vauntingly swore
That the havoc of war and the battle's confusion
A home and a country should leave us no more?
Their blood has wash'd out their foul footsteps' pollution.
No refuge could save the hireling and slave
From the terror of flight, or the gloom of the grave:
And the star-spangled banner in triumph doth wave
O'er the land of the free and the home of the brave.*

*Oh! thus be it ever, when freemen shall stand
Between their loved homes and War's desolation!
Blest with victory and peace, may the Heav'n-rescued land
Praise the Power that hath made and preserved us a nation.
Then conquer we must, for our cause it is just,
And this be our motto: "In God is our trust."
And the star-spangled banner in triumph shall wave,
O'er the land of the free and the home of the brave.*

In Russia, the 'Internationale' (words by E. Pottier) replaced a prayer for the czar. The Polish people sang with new fervor their loved 'Jeszcze Polska nie Zginela' (Poland's Not Yet Dead in Slavery), written during the revolt of 1830. In Czechoslovakia, before the German conquest, the Czech anthem was 'Kde Domov Muj' (Where Is My Homeland?), and the Slovaks sang 'Nad Tatrou Se Blyska' (Lightning Above the Mountains). The Bohemian 'War-Song of the Hussites' was first heard in the 15th century. The Yugoslav anthem 'Bože Pravde' (God of Justice) comprises the first stanzas from the old national hymns of Serbia, Croatia, and Slovenia.

Songs of Germany and Scandinavia

'Deutschland, Deutschland über Alles' (Germany Above All), the poem written by Hoffmann von Fallersleben in 1840 and set to the music of Haydn's 'Austrian Hymn', fell under the ban of the German republic after the World War, but was later restored as the national anthem. Even more popular under the Nazi régime is the 'Horst Wessel Lied', written by a young Nazi leader, Horst Wessel, who lost his life in 1930. The melody is an old German folk-song. 'Die Wacht am Rhein' (The Watch on the Rhine), with

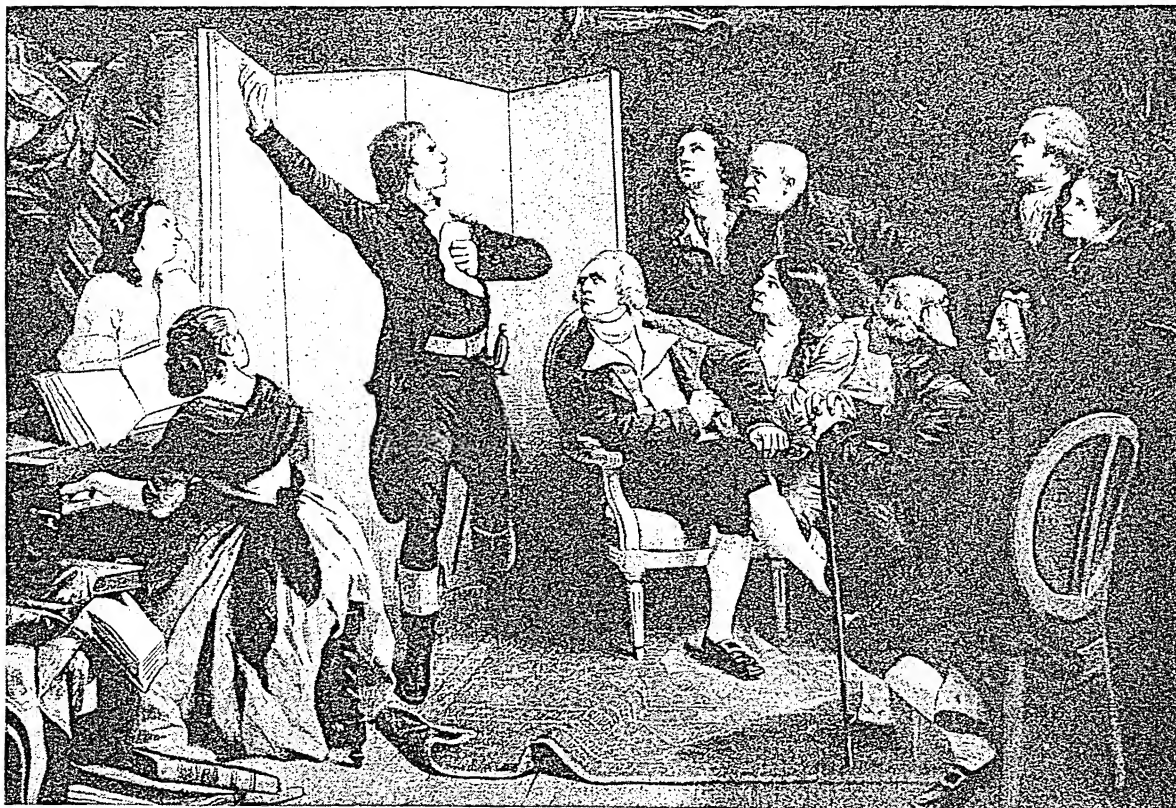
verses by Max Schneckenburger to the music of Karl Wilhelm of Schmalkalden, is another favorite.

Norway's hymns are 'Sonner af Norge' (Songs of Norway) and the national song by their great poet Bjørnstjerne Bjørnson, 'Yes, We Love with Fond Devotion Norway's Mountain Domes'. In Sweden, 'Ur Svenska hjertens' (From Swedish Hearts), called the King's Song, was written by Karl Strandberg and set to music by Adolf Lindblad, teacher of the famous Swedish singer Jenny Lind. In Denmark, the warlike words of 'King Kristian stod ved højen mast' (King Christian Stood Beside the Mast) have been ringing since 1775. The words are by Johannes Evald, the music by John Hartmann. The national song of Finland is 'Vart Land' (Our Land), with words by J. L. Runeberg and music by F. Pacius.

An Anthem Without Words

Two patriotic hymns are sung in the Netherlands—'Wilhelmus van Nassouwe' and 'Wien Neêrlansch Bloed'. The Swiss national anthem 'Rufst du, mein Vaterland', by J. R. Wyss, is sung to the familiar tune of 'America'. There are no words to Spain's anthem, the centuries old 'Marcha Granadera', which used to be called 'Marcha Real'. 'Traeisca Regele'

ROUGET DE LISLE SINGING THE 'MARSEILLAISE'



The 'Marseillaise', the most famous of all battle hymns, was first sung by its author to a group of friends. Imagine you hear him just beginning. This is the first verse and the refrain translated into English:

*Ye sons of France, awake to glory,
Hark, hark what myriads bid you rise!
Your children, wives, and grandsires hoary,
Behold their tears and hear their cries.*

*Shall hateful tyrants, mischief breeding,
With hireling hosts, a ruffian band,
Affright and desolate the land,
While peace and liberty lie bleeding?*

*To arms, to arms, ye brave!
Th' avenging sword unsheath!
March on, march on, all hearts resolved
To victory or death.*

(Long Live the King) won for V. Alexandri the prize offered by the Rumanian government in 1861 for the best national anthem. The music is by E. A. Hübsch.

The Greek 'Ethnicos Ymnos' (The People's Hymn) is known in English through the translation by Rudyard Kipling. Eastward, the Persians sing 'Salamati Shah'; Egypt has the 'Salaam Effindina' (March of the Khedive); the Turkish anthem is 'Istiklal Marsi' (March of Independence); the Chinese favorite is 'Song of the Kuomintang', whose fiery words came from a patriotic address by Dr. Sun Yat-sen. Japan sings 'Kimi Ga Yo Wa' (In the Reign of Our Emperor).

Latin American national hymns blaze with a fervent love of liberty and country. They include Argentina's 'Oíd mortales, el grito sagrado' (Hear, O Mortals, the Sacred Call); Chile's 'Dulce Patria' (Dear Fatherland); Peru's 'Somos libres, seamoslo siempre' (We Are Free; Let Us Be So Ever); Brazil's 'Hymno da Proclamação da Republica' (Hymn of the Proclamation of the Republic); Mexico's 'Mexicanos, al grito de guerra' (Mexicans, at the Cry of War); and El Salvador's 'Saludemos la Patria' (Let Us Hail Our Country).

NATURALIZATION. "I hereby declare, on oath, that I absolutely and entirely renounce and abjure all allegiance and fidelity to any foreign prince, potentate, state, or sovereignty of whom (which) I have heretofore been a subject (or citizen); that I will support and defend the Constitution and laws of the United States of America against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; and that I take this obligation freely without any mental reservation or purpose of evasion: So help me God. In acknowledgment whereof I have hereunto affixed my signature."

This is the oath taken by a foreigner as the final step in becoming naturalized, or admitted to citizenship, in the United States. It is administered in court and is frequently accompanied by an impressive ceremony arranged by a patriotic society, a social service agency, the public school authorities, or some other group. After he takes the oath the new citizen is given his certificate of citizenship, or *final paper*.

The Process of Naturalization

To become naturalized an alien first obtains from the Commissioner of Naturalization a *certificate of arrival*. This gives information showing that he has been lawfully admitted to the United States. At any

time after his arrival, if he is at least 18 years old, he may make his *declaration of intention* to become a citizen (or "take out his first paper") before the clerk of a court. In not less than two nor more than seven years thereafter he may file his *petition for citizenship* (second paper), if he has lived continuously in the country for five years. He must provide two witnesses who are citizens to take oath as to his good character and his five years of residence.

An examiner from the Immigration and Naturalization Service tests the applicant's knowledge of the

English language and of the organization of the United States government; and makes certain that he understands and accepts the fundamental principles of the Constitution. At his final hearing in open court the applicant is further examined. If he is a polygamist, an anarchist, or has been convicted of a crime, he is rejected. Aliens are trained for naturalization in adult education classes of public school systems and by other agencies.

Chinese, Japanese, Hindus, and Burmese may not become citizens, but Negroes may. A naturalized citizen may lose his American citizenship by residing two years in his native land or five years in other foreign countries.

Wives and Children

When a parent becomes a citizen, his or her minor children are automatically natu-

ralized. But an alien wife of a native-born or of a naturalized citizen must take out her own final paper since the Cable Act was passed in 1922. This act, as amended in 1931, permits the American wife of a foreigner to retain her United States citizenship.

Since 1934 a child born in a foreign country is a citizen if either one of its parents is a citizen at the time of its birth. If one parent is an alien, however, a foreign-born child must live in the United States continuously for five years between the ages of 13 and 18 to keep his citizenship. He must also, within six months of his 21st birthday, take the oath of allegiance.

Laws and Treaties

In the United States naturalization is regulated by Congress, which makes new laws or amends old ones from time to time. All the leading nations have naturalization laws and many of them have treaties with other nations, in order to avoid difficulties resulting from transfers of citizenship or from differences in nationality laws. The United States has a number of such treaties. (See also Citizenship.)

JULIA WARD HOWE



Author of the 'Battle Hymn of the Republic', which became one of the stirring songs of the North during the trying years of the Civil War. The words, which were published in 1862, were sung to the tune of 'John Brown's Body'.

“WHAT’S THAT!”—AN INTERRUPTED MIDNIGHT DRINK



Timid creatures like the deer come to their drinking places at night. This beautiful animal was about to drink at a forest pool when it heard the click as the shutter of the camera opened. Just as it looked up startled, the flash went off and produced this picture.

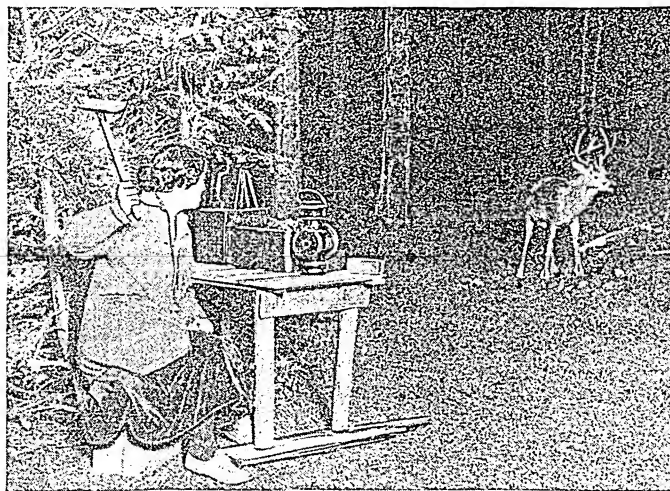
LEARNING to READ in NATURE'S WONDER BOOK



Have you ever tried "hunting" with a camera? If you want to get close to the great out-of-doors, the camera will give you all the thrills of shooting, and a lasting record of every pleasure as well. As a pastime picture-hunting is unexcelled.

NATURE STUDY. If you were lost in the woods in the day-time could you find the north? Why is the water shallower on the inner side of a bend in a stream? Why does snow fall sometimes in shell-like spirals or whorls around the corner of a building or other solid object? Why, on a cold sunny day, does the snow to the north of an open-barred fence or gate melt in honey-combed slanting ridges instead of subsiding smoothly and evenly like the snow in the open fields? Which birds in your neighborhood stay throughout the winter, and which go South? Do you know when each winter absentee gets back in the spring?

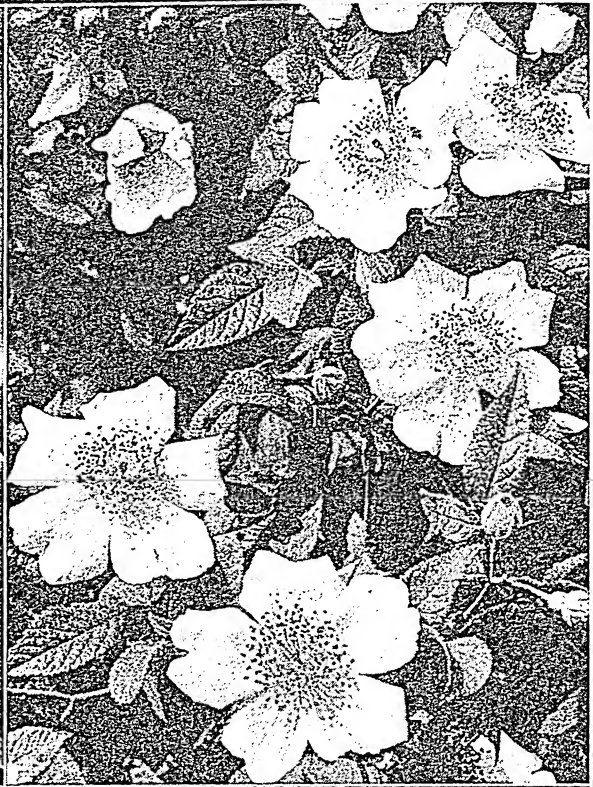
HOW WILD ANIMALS ARE "SNAPPED" AT NIGHT



A bull's-eye lantern is set on the table beside the camera. Its glare attracts the curious forest creatures. The camera shutter is opened, and the flash light the woman is holding in her hand is set off at the proper moment.

When do the first houseflies begin to buzz? When do the horses and other farm animals begin to shed their winter coats? Are potato roots above or below the tubers? Which way does a morning-glory vine turn, to the right or to the left? What does a clover leaf do every night? Does a wood sorrel, which has a similar leaf, do the same thing? Why does the sunshine streaming through the tiny chinks in a closed shutter fall on the floor in round blobs instead of triangular or rectangular patches corresponding to the cracks through which it is admitted? Why are the pebbles in the bed of the brook all rounded? Have you seen rounded pebbles anywhere else? What do they tell you?

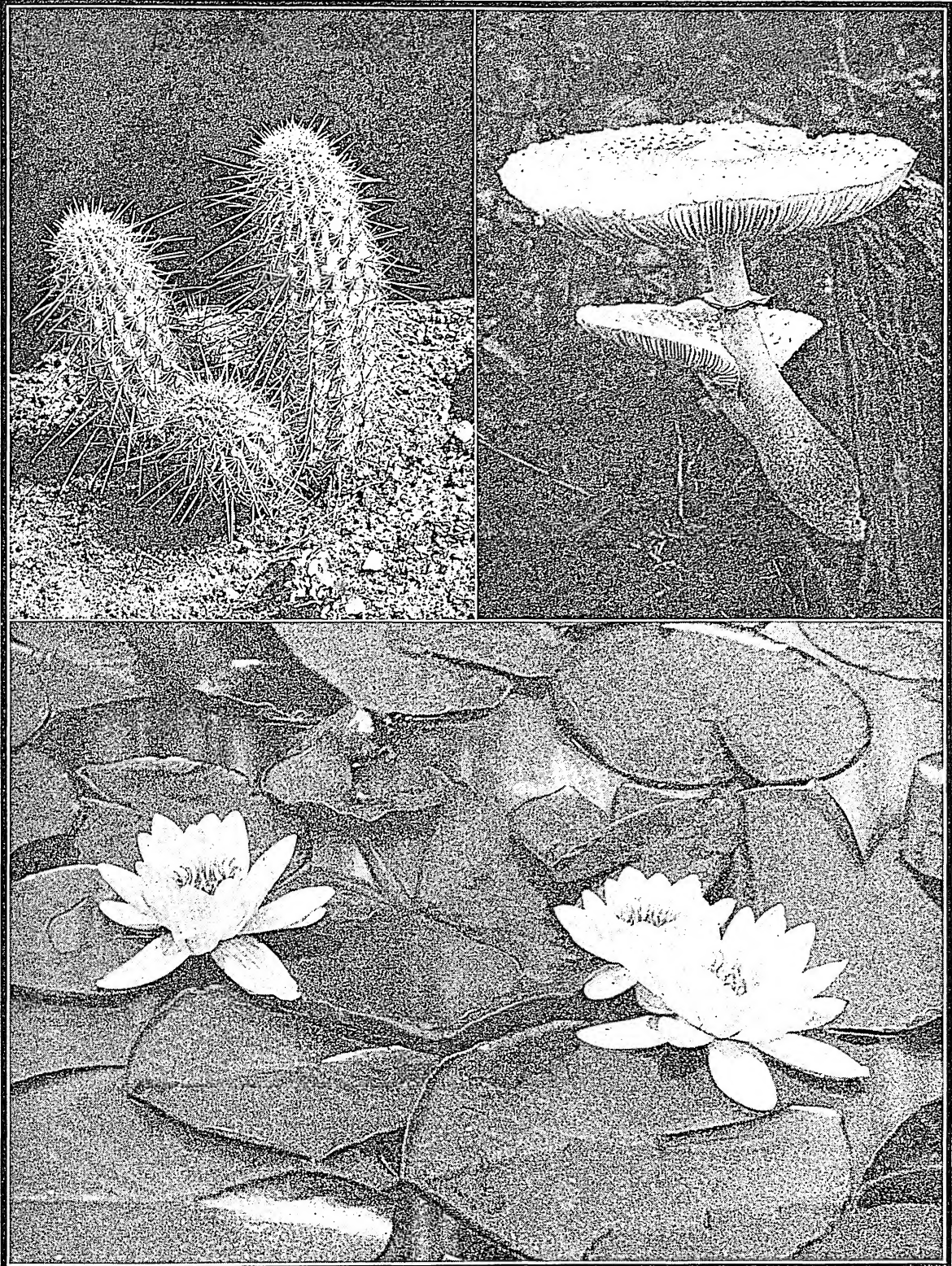
ON THE ROAD TO NATURE STUDY



A valuable early lesson is that some definite purpose is always served by the shapes and colors and habits of living things. For example, the lady's slipper (upper left) catches and holds moisture in its oddly formed blossom. This attracts thirsty insects just as the nectar of the wild roses (upper right) attracts hungry ones. The insects help the plants by spreading

the fertilizing pollen. The strange blossom of the Dutchman's breeches (lower left) is still a mystery. Why does it have those two "legs"? Perhaps some young nature student will find out one of these days. The meadow salsify (lower right) sends its seeds flying in downy balloons to hunt new homes. If they fell into that tangled grass, they would have no chance to grow.

SOME POINTERS FROM PLANT LIFE



Here are three types of plants that manage to live under conditions that would be impossible for most members of the plant world. The cactus (upper left) with its thick, water-saving shape, thrives in the dry desert. The mushroom (upper right) lacks the green coloring substance with which other plants are able to manufacture their own food from raw materials of air

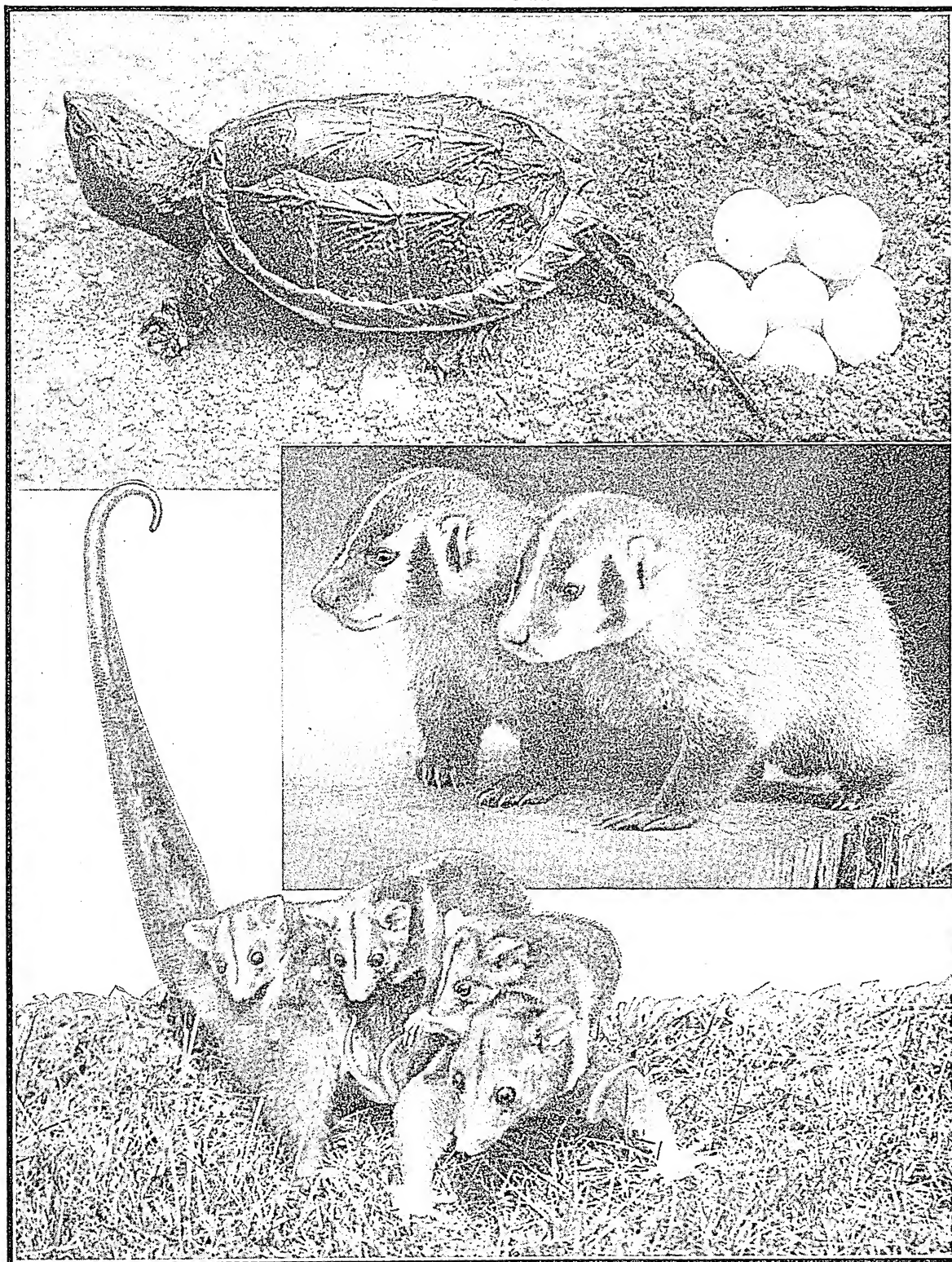
and earth. So it has to live as a parasite on other plants or on plant mold. This one is rooted in the bark of an old tree stump. The water-lily (below) makes its home in pools, sending its leaves and blossoms to the surface. Notice how the edges of the leaves turn up to form small "flatboats" that help to support the flowers—a striking example of natural adjustment.



To make sure of a food supply and to protect themselves from enemies—these two purposes explain many of the peculiarities we find in nature. The quills of the porcupine (top) protect his slow-moving animal against stronger, swifter enemies. They are not weapons of attack, nor can the "porky" throw them at an enemy, as some people believe. The chipmunk (in circle)

does not stop to eat the nuts he gathers from dangerous open ground. He packs them quickly in his big cheek pouches and eats them later in leisure and safety or stores them for the winter. The woodchuck or groundhog (below) stores his winter nourishment in his own body in the form of fat. Then he crawls away into his hole and sleeps, gradually digesting his surplus flesh.

SOME POINTERS FROM ANIMAL LIFE



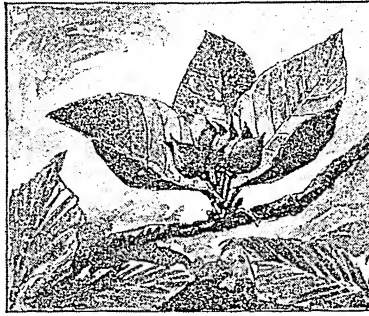
The female snapping turtle (top) buries her eggs in a sandy open spot where the heat of the sun can hatch them. She does not stand guard over them; her skill in hiding the traces of the hole is the only protection the eggs get. Here we see her looking around for possible enemy observers before she fills in and smooths off the nest. Those two young badgers (middle) are born to seek their living and save their lives by digging. They

will have to burrow in the ground for the insects and small animals they feed on, and they will have to be able to tunnel swiftly out of reach when beset by enemies. Notice their front paws and claws, already well developed for their life's work. Like all mother opossums, the woolly opossum (below) of Central and South America carries her young on her back. Their clinging tails help them hang on when the mother climbs trees.

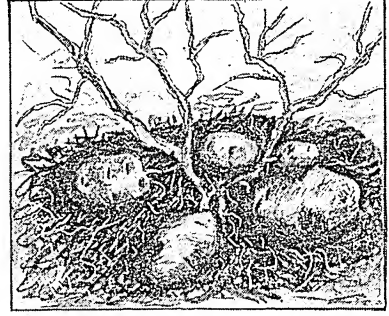
SOME PICTURE QUESTIONS FROM NATURE'S BOOK



The Chickadee stays with us all winter. Can you name other common birds which do not migrate? This will be easy if you have kept your eyes open in time of snow and frost.



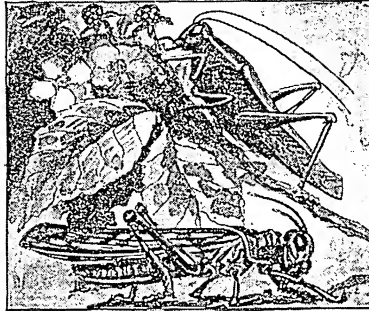
This picture shows you how many blossoms there are in an apple cluster. Do you know how many in a Dogwood cluster? Watch for it the next time you go out in blossom time.



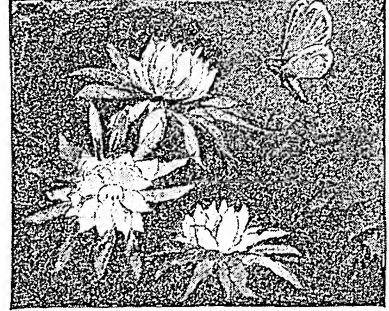
Potatoes are not true roots, but modified underground branches of the plant. They usually grow above the true roots. Do you know how the roots of an Onion grow and how the bulb is formed?



The Morning Glory twines around its support in a direction opposite to the way the thread of a screw runs. Do you happen to know how the stems of the Hop or the Wistaria twine?



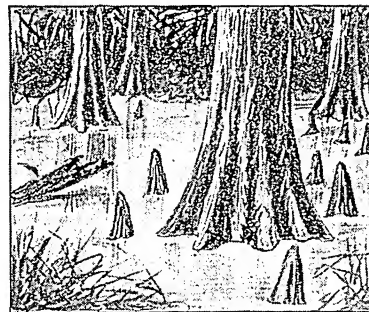
You can tell the difference between a Locust and a Grasshopper by the length of their feelers or antennae. Which is which in this picture? What are the other chief differences?



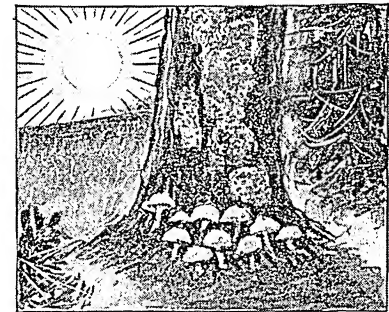
Most of the flowers that bloom at night dress in white. Why is this? What has that Moth got to do with it? If you look far enough you'll find a reason for every shape and color in nature.



Most of the Pebbles in running streams are round from the rolling action of the water which wears them down. What would you think, if you found a bed of round pebbles on a mountain top?



Trees growing in swamps have to send up their roots above the water to get air. What are some of the swamp trees? Can you recognize this one from the curious "knees" that surround it?



Fungi usually grow only on one side of a tree. Which side is it? What has sunlight and the color of the plants to do with it? Can green plants live always in the dark?

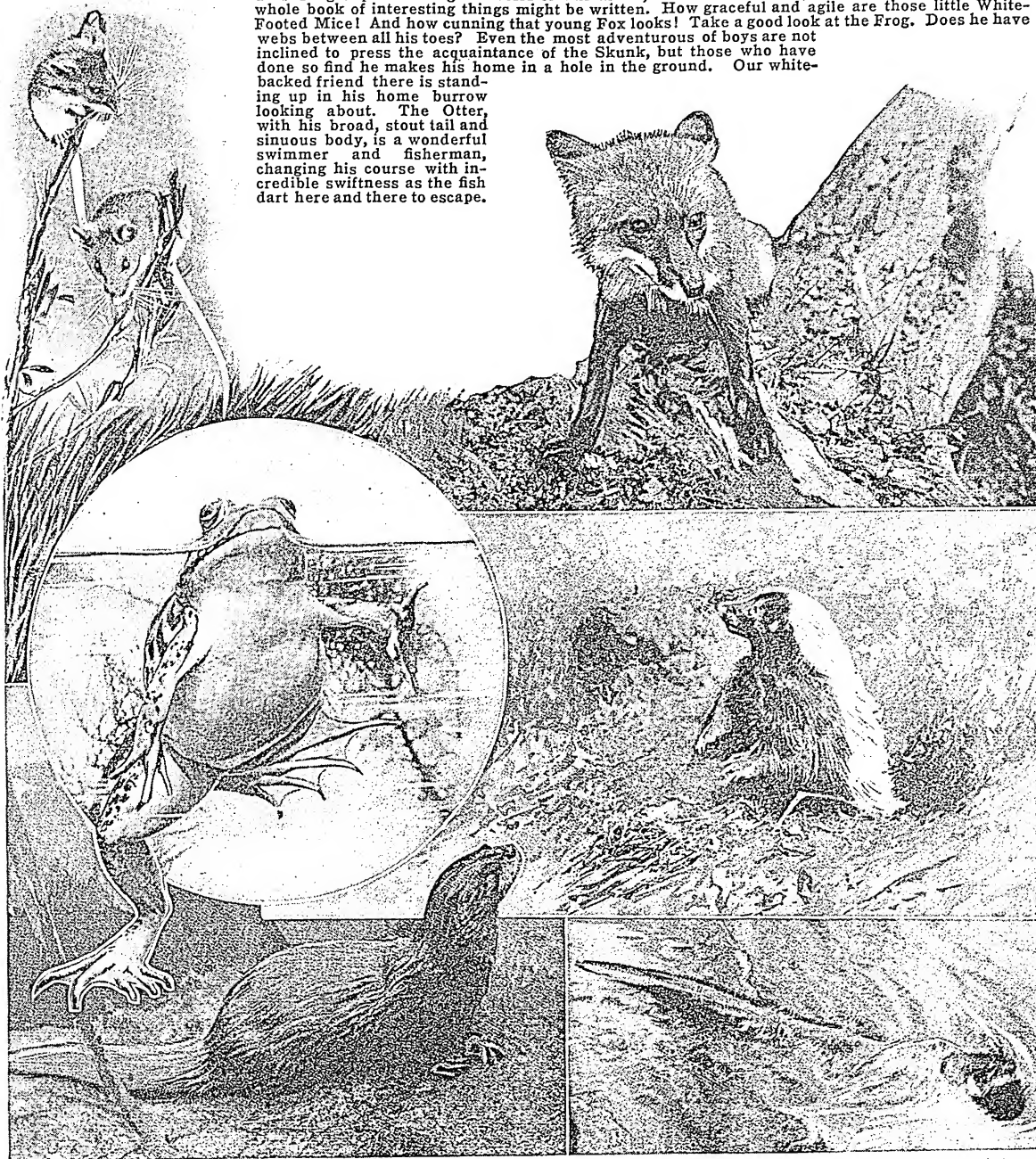
One misses at least three-quarters of the fun of living in this remarkably interesting world if one goes through it blind to the curious and beautiful sights spread out before one's eyes, and deaf to the thousand and one fascinating stories told by every leaf and pebble and feather. Someone tells the story of bewildered tourists (who might far better have stayed at home) going through the Vatican at Rome, identifying the Apollo Belvedere and other masterpieces of ancient art by the labels on the pedestals, and checking each one off in the catalog, without ever once taking the trouble to glance up and see the glorious works themselves. Too many of us go through life very

much that way. We look at things just enough to make sure that we fasten the right names to them—that at least we don't call a cat a dog, or mistake a cow for a horse—and there we stop.

In certain orchards the blossoms on some of the branches of the apple trees withered and died while the blossoms of other branches produced fruit. The farmers consulted an agricultural expert to find out what the matter was and what could be done about it. The expert asked what the withered flowers looked like and what could be seen on the branches. What were the symptoms? Nobody had thought to look for any; the flowers had just died, that was all. But,

HERE AND THERE IN THE WORLD OF NATURE

This is a group from the great world of animal life, selected at random, but about any one of them a whole book of interesting things might be written. How graceful and agile are those little White-Footed Mice! And how cunning that young Fox looks! Take a good look at the Frog. Does he have webs between all his toes? Even the most adventurous of boys are not inclined to press the acquaintance of the Skunk, but those who have done so find he makes his home in a hole in the ground. Our white-backed friend there is standing up in his home burrow looking about. The Otter, with his broad, stout tail and sinuous body, is a wonderful swimmer and fisherman, changing his course with incredible swiftness as the fish dart here and there to escape.



asked the expert, hadn't they seen the affected limbs? Oh, yes, said the farmers, they had seen them—from the barnyard!

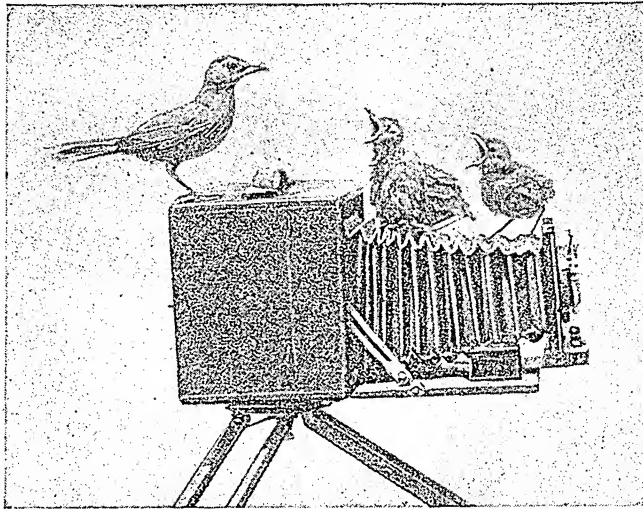
Does such unobservant heedlessness seem absurd? But how many of us show a greater degree of intelligent curiosity in regard to "common things"? Don't we take a day off to go to the zoo or the menagerie, and gape at the lion and the hippopotamus, without realizing that we have at home in the pet kitten a specimen of the genus *Felis* which is just as interesting as a lion

or a tiger; and that on any August day we can pick up from the field a far more grotesque monster than the hippopotamus—a grasshopper? When we exclaim in delight at a stereopticon picture of a bamboo jungle in Borneo, do we realize that there is just as wild and beautiful a jungle in the grass-grown fence corner? Perhaps we think we know all about cats, grasshoppers, and grass. Do you know how many toes a cat has on each foot, or how a newly hatched grasshopper differs from a full-grown one?

Nature study is just keeping one's eyes, ears, and mind open to the sights and sounds, the facts and the fascinating puzzles, of the natural world. Anyone who lives in the country is fortunately placed for such study. But there are few places from which Nature is entirely shut out; and wherever winds blow, sun and stars shine, snow and rain falls, weeds grow, and flies and wasps buzz, there are the materials for studying Nature.

Microscopes, field-glasses, and other tools of science are helpful things, but anyone with two good eyes and really intelligent curiosity about the world may be fortunate enough to make a real discovery. A little girl noticed that grasshoppers in great numbers would jump on her white dress, while they did not seem to be attracted by her colored dresses. She asked her teacher why grasshoppers like white. He did not know, and sent the query on to an eminent entomologist, who

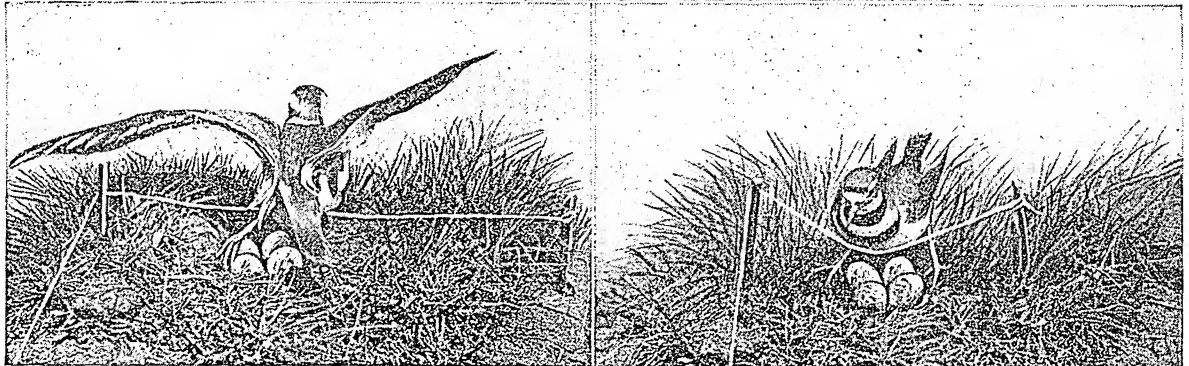
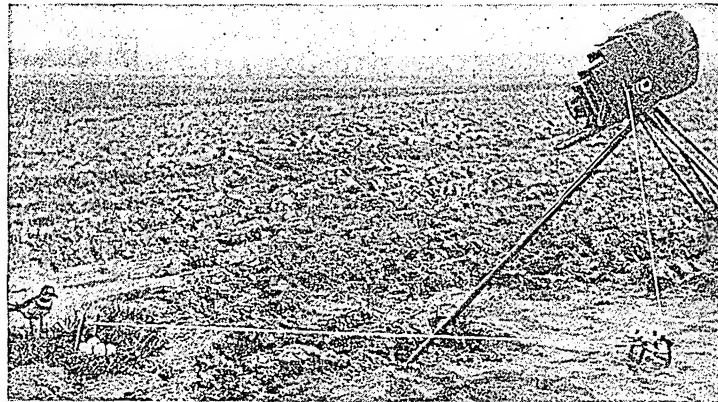
THEY'RE NOT AFRAID OF THE CAMERA



The mother Cat-bird and her two young ones have settled down in the very place where the camera can't photograph them. It took another camera to get this picture. What do you suppose those young ones are saying? Perhaps they are trying to pronounce their scientific name *Dumetella carolinensis*.

good for much else than his beloved insects (see Fabre, Jean-Henri).

HOW MRS. KILLDEER TAKES HER OWN PICTURE



The way the bird is made to take her own picture is ingenious. Two sticks are driven down on each side of her nest. A string is tied to one stick and passed around the second stick, extending to the trigger of a spring-wire mouse trap that is fastened rigidly to the ground. The shutter release on the camera is fastened to the U-shaped wire of the trap. When Mrs. Killdeer alights on the nest, she pushes down on the string, giving it a gentle pull which draws the trigger of the trap and sets free the powerful U-spring, which in turn pulls the shutter and takes the picture.

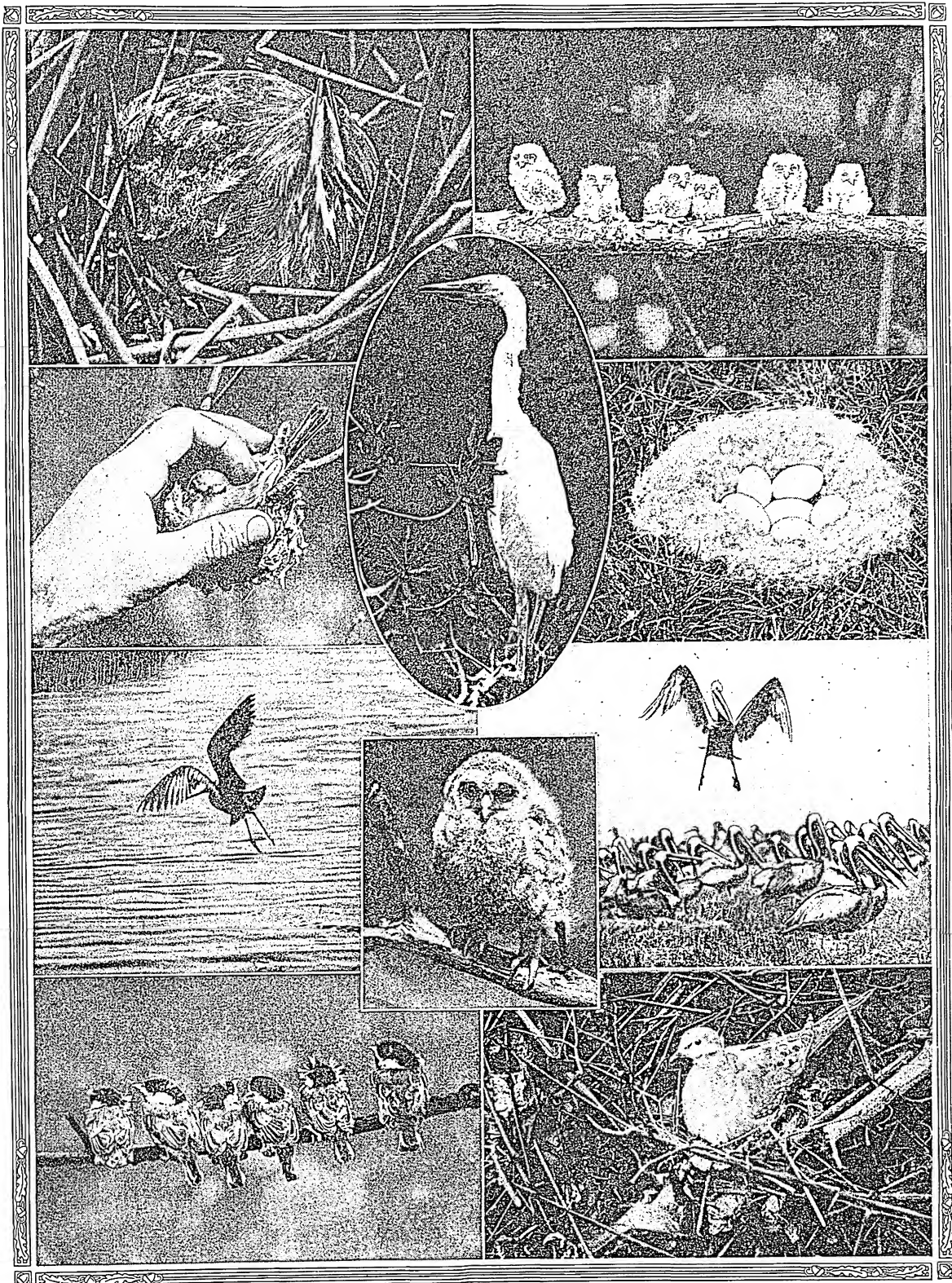
replied that he had never known that grasshoppers showed such preference, and that the little girl had made an important observation, which would have to be followed up.

One need not stir from home to find opportunities for studying Nature. The great French naturalist Fabre, who made the stories of the ants, the bees, the wasps, and the beetles more interesting than most novels, for 30 years never left his little farm, which was too small and too poor to be

beloved insects (see "Nature books" are among the most delightful contributions to literature. Anyone who becomes deeply interested in any phase of Nature will want to know what has been written about it. But the real textbook is Nature herself.

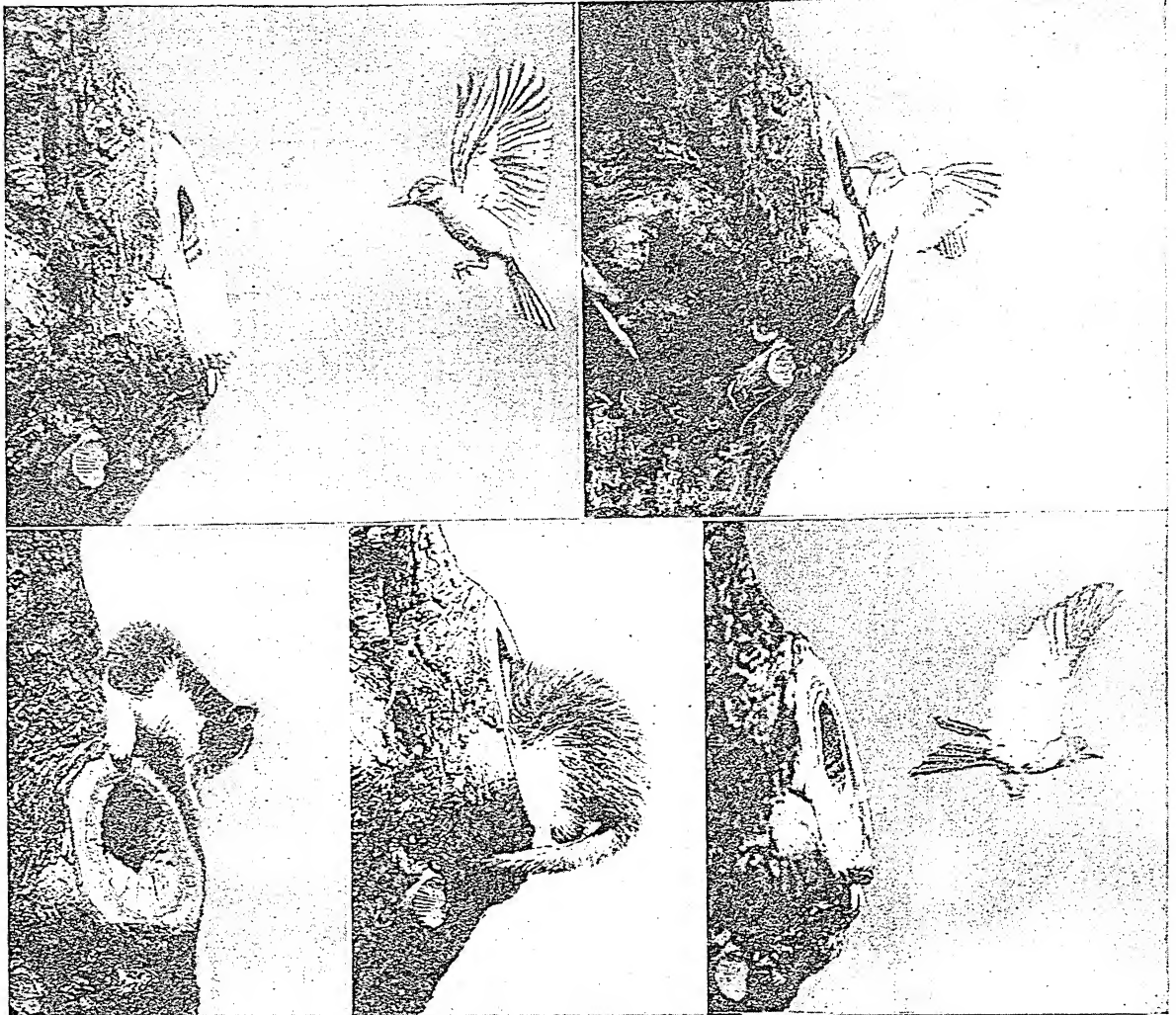
How can one begin? "Stop, look, and listen"—and think; that is the

PICTURES FROM A NATURE LOVER'S ALBUM



Here are ten interesting snapshots from the collection of a naturalist: A nesting Bittern; six young Screech Owls; a mother Vireo on her nest; young Great White Heron, almost ready to fly; Wild Goose's nest, with its lining of down; a Godwit (a member of the snipe family), at the beginning of its flight; a young Barred Owl; a colony of Brown Pelicans; six baby Chickadees; and a Mourning Dove on her nest.

THE STORY OF THE CAT AND THE FLYCATCHER



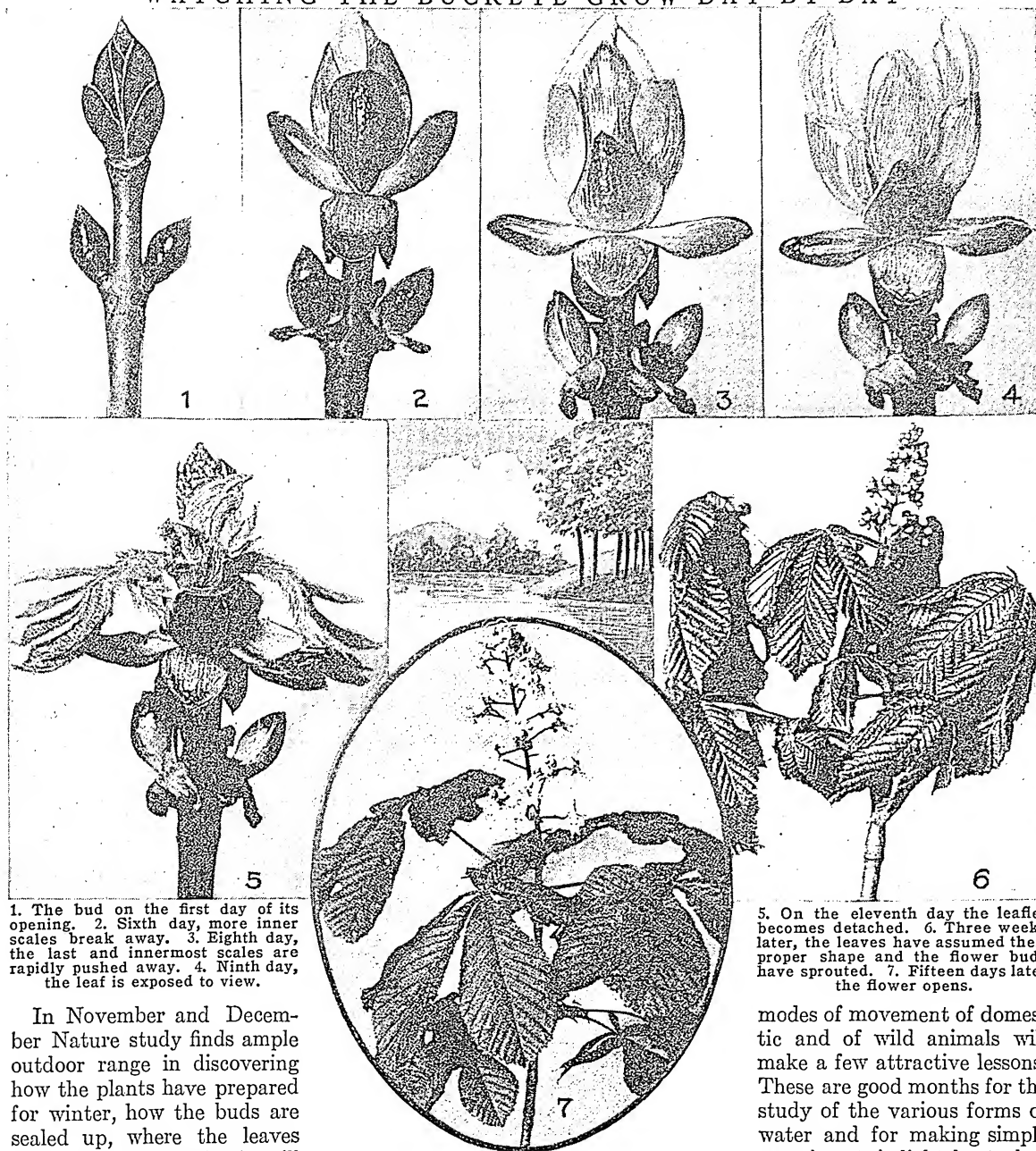
Little Mother Flycatcher had moved in where a Woodpecker had moved out, had made her nest interwoven with a dried snakeskin, after the manner of her people, and had hatched her little brood. Along came that cat, climbing clear up to the nest, although it was six feet above the ground, and poked in her head with the idea of eating the little Flycatchers. But Mother was on the nest and she pecked at that cat's eyes with her bill, and beat it in the face with her wings, so that it backed out as fast as it could and went scampering down the tree. Then little Mother Flycatcher started out to get something for the family supper.

essential thing. You might find it interesting to keep a calendar of Nature happenings, as did Thoreau, who "kept an account of the flowering day of plants as a banker does of the day when his notes fall due," and who believed that if he were waked up out of a trance in his familiar swamp he could tell by the plants what time of year it was within a few days. If you become especially interested in birds or butterflies or flowers or ferns, or anything else, you will want to "camp on the trail" of the creature or plant until you have learned all you can about it.

In September or October there are many interesting and instructive features of plant life which furnish the material in sufficient variety for several lessons; the more common autumn fruits of the locality, wild and cultivated, with a study of their form, texture, flavor, name, and use; the autumn leaves and flowers,

with a study of their form, color, etc.; the autumn seeds, their forms, methods of distribution by winds, by animals, by water. The animal life of these months is full of interest for young and old. The birds which have summered in the locality are going South and others with strange plumage are coming from the North on their way farther south or to spend the winter here. Insects are gradually disappearing in a variety of ways, some going into winter quarters to appear in new forms in the spring, others hiding away in the trees, in the earth, or elsewhere, while countless multitudes deposit their eggs and die. The thickening of the coats of the wild and domestic animals should be carefully observed now and in the month following. Clouds, rain, dew, frost, changes in temperature, direction of the wind, will interest the child every month in the year.

WATCHING THE BUCKEYE GROW DAY BY DAY



1. The bud on the first day of its opening. 2. Sixth day, more inner scales break away. 3. Eighth day, the last and innermost scales are rapidly pushed away. 4. Ninth day, the leaf is exposed to view.

5. On the eleventh day the leaflet becomes detached. 6. Three weeks later, the leaves have assumed their proper shape and the flower buds have sprouted. 7. Fifteen days later the flower opens.

In November and December Nature study finds ample outdoor range in discovering how the plants have prepared for winter, how the buds are sealed up, where the leaves have gone, what animals still remain in the locality and how they live, what the streams are doing, where the fish and other water animals have gone, what the farmers are doing. They also are good months for studying further the collections of fruits, seeds, leaves, grasses made in other months. Why are the days so short now? Why is the sun so far south?

The weather is a fruitful theme during January, February, and March, but there is much also to engage attention in the lines mentioned for the preceding months. A simple study of the forms and

modes of movement of domestic and of wild animals will make a few attractive lessons. These are good months for the study of the various forms of water and for making simple experiments in light, heat, elec-

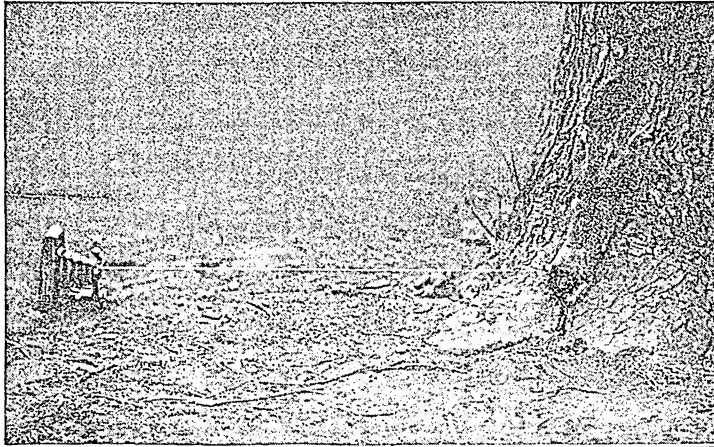
tricity. Note later the signs of springtime in the growing length of the days, in the disappearance of frost and snow, in the swelling and opening of certain kinds of buds, in the flowing of the sap in the trees, in the appearance of an occasional last year's animal, in the song of the robin or the quick cry of the redbird, in the buzzing of venturesome bees, in the work about house and farm.

April, May, and June conspire to furnish a world of material to attract and interest childhood. The studies should include the germination of seeds, the

unfolding of leaves, the opening of the flowers; the parts of the plant, of the leaves, and of the flowers; the various animals that cover the earth and skim the

posed, game-laden plates at nightfall without any scruples about being called a pot-hunter or a game-hog." In introducing a book of wild life illustrated

THE SQUIRREL AS A PHOTOGRAPHER



air; the molting of the birds; the metamorphosis of the grasshopper, the butterfly, the frog; the building of nests; the swarming of the bees; animal foods. They should also include all kinds of work about farm and home and keep the child in close touch with ploughing time and seed time and harvest; with the pests the farmer fears; and with the friends he should protect.

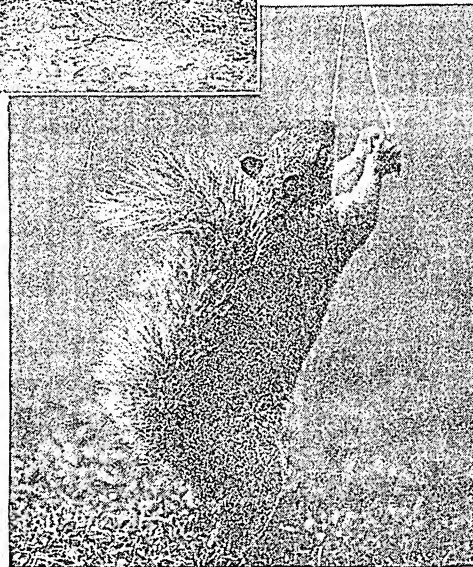
July and August, as well as a great part of June, are months in which the child is usually out of school, but if the teaching during the other months is successful, these months also will have much in experiences upon which he will find pleasure in drawing as school opens in September.

If you are lucky enough to possess a camera you will find "camera hunting" one of the most fascinating of pursuits. More and more sportsmen are coming to realize that they can substitute the camera for the gun and enjoy all the pleasures of the chase without leaving the world poorer by the annihilation of the little people of field and forest. One camera enthusiast says: "Every camera hunter must admit that more immediate and lasting pleasure is afforded in raking a running deer from stem to stern at twenty yards with his 5x7 bore camera than in driving an ounce ball through his heart at 100 yards. Then think of the unlimited freedom of this noiseless weapon. No closed season, no restriction in numbers or methods of transportation, no posted land; but you can pull on a swimming deer or an elk floundering in the snow, take a crack at a spotted fawn, bag the bird on its nest or string your cameras out like traps, with a thread across the runway, and gather in the ex-

posed, game-laden plates at nightfall without any scruples about being called a pot-hunter or a game-hog." In introducing a book of wild life illustrated with the camera President Roosevelt wrote: "The older I grow, the less I care to shoot anything but 'varmints'. If we can only get the camera in place of the gun and have the sportsman sunk somewhat in the naturalist and the lover of wild things, the next generation will see an immense change for the better in the life of our woods and waters."

This use of the camera has proved of distinct value in aid of Nature study, providing the means of gaining a clear and intimate knowledge of wild animals,

birds, and reptiles, their appearance, their haunts, their habits, and all the phases and conditions of their life. Moreover, the young are thus enabled to become direct observers and students of animated nature; for not only have naturalists brought from the Rockies, from the forests and waters of Canada, and from the shores and everglades of Florida the trophies of their skill and patience in a wealth of photographic pictures, but ama-

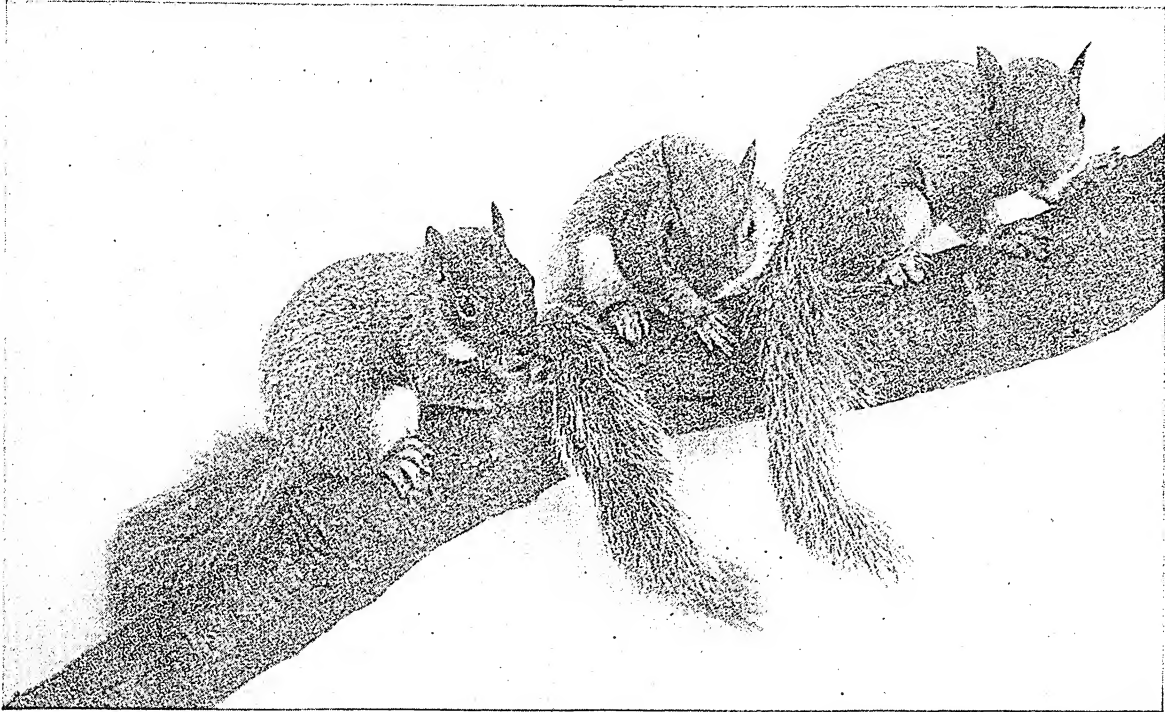


You fix a nut on the end of a string, attach it to the shutter of a camera like that, and Mr. Squirrel does the rest, as you see in the top picture. A similar device will take him standing on his hind legs, as in the second picture.

teurs, even schoolboys and girls, have become expert in securing photographs of the more familiar birds and animals to be found in field and forest accessible to every village and town. Stalking a bird, a rabbit, a squirrel, or a gopher, is an experience full of interest. You will come to note in what surroundings the bird or animal is found, what it is doing, if feeding what sort of food it is eating, the place and character of its nest or burrow. The pictures when developed recall these details and fix them in the mind, and thus you become possessed of a fund of valuable information obtained at first hand, and as your experience grows you can attempt more difficult feats. The mature lad will give zest to his vacations and holidays by becoming a hunter of wild life with camera and flashlight.

Thrilling are the experiences and splendid the rewards of one who hunts with a camera.

SOME OF THE WAYS OF SQUIRRELS AND RABBITS



Why does a squirrel jerk and switch and wave his tail so vigorously as he runs or climbs or jumps from branch to branch? Because he uses his tail just as a tight-wire walker uses a pole or an open parasol—to balance himself. These three young squirrels have not yet learned perfectly this art of keeping their balance, so they are sitting pretty still and hanging on while they watch the camera. During winter nights those tails will curl around their feet and noses to keep them warm.



The photographer has pushed the long grass aside to make a picture for us of a nestful of young cottontail rabbits. See how quiet and trustful they are. They need to be well hidden to escape their many enemies. The mother rabbit has hollowed out this spot in thick undergrowth and has lined it with fur taken from her own body. If you came close to the nest without knowing where it was, you would not hear a sound of stirring or a single squeal, no matter how hungry the little ones might be. For they know by instinct that a noise would perhaps attract a passing coyote or mink or weasel.

A Wild Garden and Its Tenants

THIS is the story of a wild garden that was found near a public school on the edge of a big city. None of the children had the tiniest garden, and they were not allowed to pick flowers in the parks, even to use in the school-room for nature study. So this wild garden, where they could pick armfuls of flowers, where they could pull plants up by the roots, where they could gather seed-cases and cocoons, and watch insects at work, was a wonder and a delight.

Even the teachers did not know it was a garden, at first. It was a vacant block of land 200 feet square. All around it ran a new cement walk. The ground was two or three feet below the level of the street and would cost a good deal to fill in. Perhaps that was why there were no houses on it. The soil was very poor. From the walks the earth crumbled away in steep banks of gravel, sand, and yellow clay. Water lay in sunken places, making frozen ponds for sliding in winter. There was a fallen tree-trunk and two or three rotting stumps of scrub oaks, around which

mosses and low ferns grew. In the spring the ground was boggy, and scantily covered with ragged weeds and wire-grass. Strips of blue-grass turf below the walk were dotted with the golden heads of the dandelion. In the wettest places a few clumps of blue flag lilies and pussy-willow bushes were found. Along one bank were brambles that in June blossomed with the single pink flowers of the wild rose. And there were clover blossoms.

The Wild Garden in Autumn

But that was all. When school closed in June the lot was covered with tall, coarse, ill-smelling weeds that gave no promise of flowers. But when school opened in September the place was a jungle of purple and yellow, with swarms of winged visitors.

On the strip of green sod under the edge of the walks the dandelions still showed bud and blossom and gauzy seed globe. But they did not take all the space. The grass was thick with the trefoil leaves and round buttons of white clover. And here and there was the glossy-leaved pink-flowered spike of smartweed. Clambering up the bank grew a strong rough-stemmed little vine, with leaves like a wild strawberry. At every twisted whorl of leaves was a tiny starlike flower, as yellow as a buttercup. It was the "cinquefoil" (meaning "five-leaved"), a weed which really is a far-away cousin of the strawberry. Among the cinquefoil were clumps of mint. Their long hairy stems and fuzzy leaves were topped with frowzy heads of lavender-pink fringed with silver, and breathing forth spicy smells. In every corner and in many a crack of the sloping bank stout burdocks were rooted. The purple-topped green burs in heavy knots leaned out over the walk to catch in the clothing of passers-by.

Farther afield tall thistles lifted royal purple heads crowned with plush. They had a soldier guard of sharp lances and spears, set on stem and leaf and flower. But, unafraid, wild morning-glory vines twined around their spiny columns and hung out delicate pink and red and white flower bells. The morning-glories also clambered up the dusty stalks, and bloomed among the small pale yellow flowers of the mulleins.

The Four Varieties of Clover

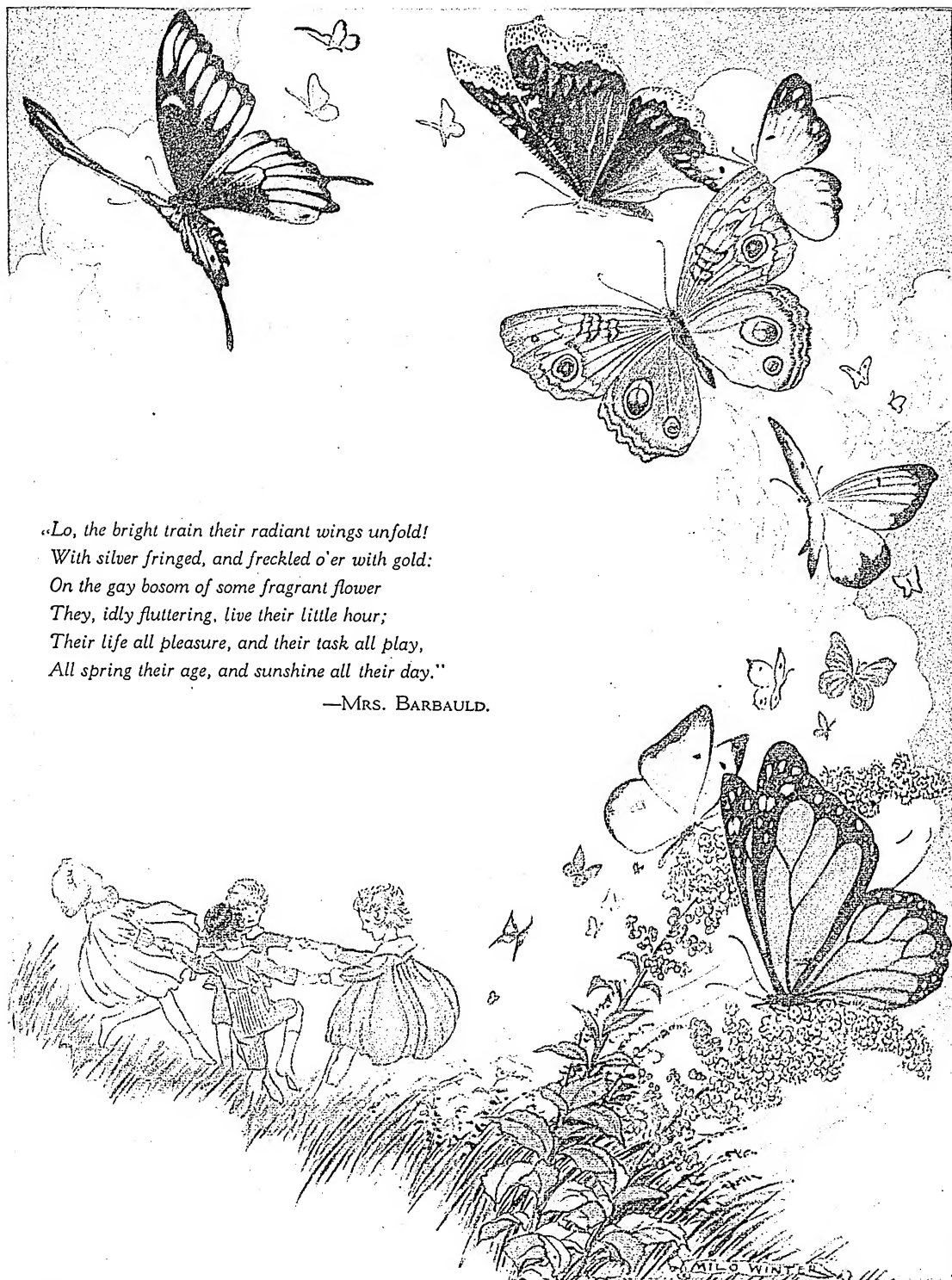
In that wild garden were four varieties of clover—the white creeping clover of blue-grass lawns; the pinkish purple-headed clover of farm meadows; the tall shrublike sweet clover, with tassel blossoms of white, and a blood-red clover with pointed heads like pine cones. The crimson clover is a foreigner. Grown all over Europe, it is not often seen in America. In that wild garden it was a well-born emigrant among rough and hardy American weeds.

Except for the clovers, the smartweed, the morning-glories, the white parasols of tansy, the mint, and a few fiery spikes of the cardinal flower, the garden was a haze of yellow, spotted with purple. The long plumes of the golden-rod made a background for

WORLD-WIDE "SKIPPERS"

Wherever in the world this Skipper Butterfly might go, he would meet relations, for the Skippers are found everywhere. Small brown things they are, and you may know them from their short jerky flights. That's how they got their nickname. He's shown here resting on the tip of a Plantain weed.





„Lo, the bright train their radiant wings unfold!
 With silver fringed, and freckled o'er with gold:
 On the gay bosom of some fragrant flower
 They, idly fluttering, live their little hour;
 Their life all pleasure, and their task all play,
 All spring their age, and sunshine all their day.”

—MRS. BARBAULD.

Painting by Milo Winter

See text on following page

NATURE STUDY AMONG THE BUTTERFLIES

The favorites of children among the tribes of insects are the butterflies whose gay, happy colors dancing in the sunshine seem to reflect the spirit of carefree youth. Identifying them with the key on the next page will be fun.

NATURE STUDY AMONG THE BUTTERFLIES

WHAT a joy to be a boy or a girl or a butterfly on a happy day of sunshine and merry winds! While a bee is all business because there is so much to do putting away honey for the winter, the butterflies haven't a care in the world. Nobody to look after but themselves, living on an occasional sip of nectar, they spend the livelong day flitting and drifting about in the golden air.

It is the "wondrous sculptured dust," the scales on their wings, that breaks up the rays of sunlight falling upon them and produces all the beautiful colors and shadings of butterflies and moths. But how a gaudy butterfly, like the Kallima of India, ever got put together so that the moment he settles on a twig and folds his gay wings he looks like an old and withered leaf—that nobody knows. Possibly you may be the very boy or girl to find out some day. Many Nature secrets quite as mysterious have been solved by men of science who began amusing themselves with Nature's puzzle pages just as you are doing this very minute.

From the top to the bottom of the gay curving line of butterflies on the next page, we see in succession a Swallowtail, a Mourning Cloak or Vanessa, a Clouded Sulphur female, a Buckeye butterfly, a Small Sulphur, a Clouded Sulphur male, and a Monarch.

everything else. Against its feathery masses were set the dazzling yellow of the field sunflowers and black-eyed Susans. Much of the mustard had gone to seed. The tall plants were hung with tiny green pods, but there were still some clusters of yellow cross-shaped flowers left hanging to them.

Lower down, hidden in wire-grass, was yellow-flowered sorrel with acid leaves that the children liked to nibble. There was many a sturdy bunch of "butter-and-eggs" with cream-and-gold lipped and spurred blossoms set on spikes, the country cousin of the snapdragons of old-fashioned gardens. There were seed spikes and broad leaves of dock and plantain; the peppery seed sprays of the tongue grass, that gave a feast to all the pet canaries in the neighborhood; and the catnip mint that made pet pussies go into spasms of delight. But these plants only added to the green of the leaves. The purple notes in the riot of yellow were given by the royal heads of the thistles, the reddish-purple spikes of the iron weed, and the violet-and-lavender ray-flow-ered clusters of wild asters.

For several days the children were puzzled by an odor as sweet as that of lilies of the valley. It could be smelled only at night, when the garden lay dim and dewy under the moonlight. The perfume was traced to weedy stalks with small green-sheathed buds. They were not noticed by day, but opened pale yellow five-petaled rose-shaped flowers after nightfall. It was the evening primrose, that grew in the shelter of dense thickets of goldenrod and asters. Big moths visited the primrose by night. In the daytime the shriveled blooms held drops of honey so sweet that wasps with steel-blue wings passed by all the open flowers to drink the delicious primrose nectar.

Above the whole field insects were always on the wing. A little white butterfly was fond of the purple thistle. Bumblebees visited the thistles, the field clover, and the butter-and-eggs. It was very funny to see a heavy buzzing black-and-yellow bumblebee drop on the lower lip of a butter-and-egg blossom, tip

it down, and force his greedy head into the long honey-filled spur. Little honey-bees liked the white clover best. The goldenrod plumes, when in full blossom and gold-dusted with pollen, were always spotted with little black beetles that could scarcely be shaken off. This same little jetty beetle was very fond of the dandelion pollen, too.

Gauze-winged dragon flies darted here and

there; grasshoppers by hundreds leaped and clicked their wings; and robins and jay-birds from a nearby park made raids on the grasshoppers. A dozen varieties of butterflies were seen by day, and many a moth by night. On every dewy morning the webs of spiders were strung with diamonds. The caterpillars had spun their cocoons on the stoutest of the weed-stalks, and flies grew sluggish in the cool nights. In dry places and between the cracks of the walks were little domes of sand, honey-combed with tiny holes. These were doors to underground houses of red and black ants.

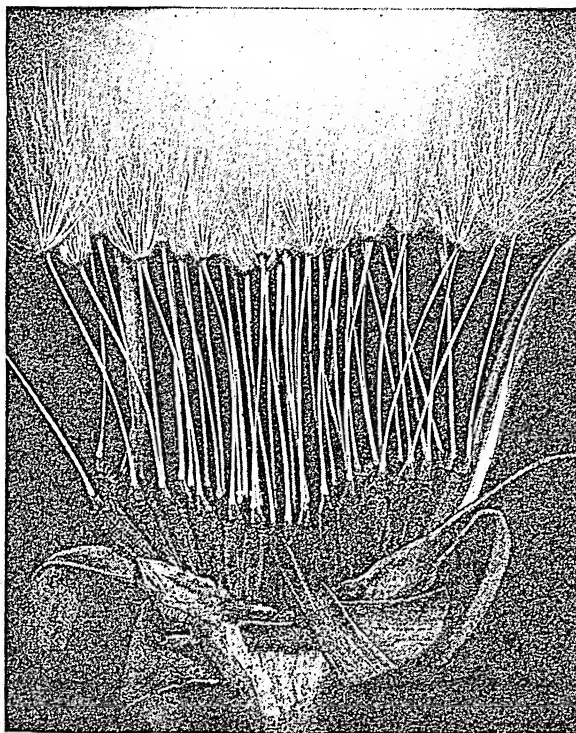
Soon there were many seeds flying about—seeds of the dandelion, the thistle, the goldenrod, the milk-weed. There were seeds with tails and wings and gauzy sails, and hooks and bursting pods. Every breeze

loosened and scattered them. When frost came and killed the blossoms, the garden was a feeding ground for many birds.

One sunny day of Indian summer, late in October, some boys digging for pupas of beetles that had gone to sleep in the ground found a nest of field mice, and caught a glimpse of a chipmunk on a stump. The school was wild about the discovery. So the teachers got books and pictures, and a dozen rooms were busy for a month studying and writing stories about chipmunks and ground and tree squirrels.

The wild garden furnished this school with living things for nature study all the year around, in plants and insects. Don't you want to know some of the things they found out? You can find most of these plants and insects by many a wayside in the country, and on vacant lots in cities. And you can learn about them by looking up the articles in this encyclopedia

THE DANDELION'S "CHILDREN"



The Dandelion floats its seeds away when they are ripe on tiny parachutes of down. This picture shows a ripened dandelion, somewhat enlarged, with the seeds ready for their first trip into the world. Notice that in addition to the white parachutes, the seeds have sharp little claws with which to cling to the ground when they alight, and so bring their travels to an end.

that tell of them. If you ask questions about the common things of life, whether mineral, plant, or animal, you will soon find yourself following adventurous paths through Nature's great garden. Begin with things that are right around you, and choose those

that you like best. The following outline will serve as a guide for Nature Study, but to make the most of it, you yourself must look at Nature's wonderland with sharp eyes, observe it with patience, and try with an inquiring mind to solve its mysteries.

—REFERENCE-OUTLINE for Organized NATURE STUDY—

I. AIR, EARTH, and SKY—INORGANIC NATURE

Things to Read

- A. The Atmosphere and the Weather:
 - a. Air: A-61. Twilight T-169.
 - b. Water: W-42. Clouds C-281; Rainfall R-46.
 - c. Winds: W-112. Storms S-298; Lightning L-134.
 - d. Dew: D-58. Fog F-132; Frost F-209; Ice I-2; Hail H-195; Snow S-173.
 - e. Rainbow: R-46. Aurora A-365; Mirage M-198.
 - f. Climate: C-270. Seasons S-71.
 - g. Floods: F-106a.
 - h. Drought: D-113a.
 - i. Weather Bureau: W-59.
 - j. Weather Recording Instruments: Thermometer 1-78; Barometer B-48.
- B. Sky Study: A-341.
 - a. Sun: S-326. Planets P-229.
 - b. Moon: M-250.
 - c. Stars: S-272. Constellations C-346; Nebulae N-60.
 - d. Comets: C-319. Meteors and Meteorites M-126.
 - e. Observatories: O-193.
 - f. The Life of Sir Isaac Newton: N-110.
- C. Rocks, Soils, and Minerals:
 - a. Rocks: R-121, M-184, G-39.
 1. Igneous Rocks: Granite G-131; Mica M-145; Quartz Q-3; Feldspar F-22.
 2. Sedimentary Rocks: Sandstone S-23; Limestone L-138; Chalk C-137.
 3. Metamorphic Rocks: Marble M-60; Slate S-158; Flint F-106.
 - b. Soils: S-190.
 - c. Minerals: M-181.
 1. Coal C-283.
 2. Borax B-192; Salt S-15; Sulphur S-323.
 3. Crystals C-409; Gems G-25.
 - d. Metals: M-121.
 1. Iron I-133; Copper C-357; Lead L-76.
 2. Gold G-111; Silver S-150.
 - e. Fossils: F-161. Prehistoric Animals A-204.
 - f. Conservation of Natural Resources: C-341.
- D. Surface Features of the Earth: P-197.
 - a. The Story of the Earth: E-128.
 - b. Land Formations: Mountains M-291; Valleys V-269; Plateaus and Plains P-198, P-200; Deserts and Dunes S-21; Caves C-116.
 - c. Water Formations: Ocean O-195; Lakes L-55; Rivers R-109; Springs S-263; Geysers G-82.
 - d. Surface Changes and Their Causes: Ice Age I-2; Glaciers G-95; Earthquakes E-135; Volcanoes V-331.
 - e. Surveying: S-331.
 - f. Maps and Map-Making: M-58.
 - g. National Parks and Monuments: N-15.
 - h. The Life of John Muir: M-297.

Things To Do

1. Keep a record of the weather, noting the number of clear, cloudy, snowy, or rainy days during the month.
2. Draw pictures of different kinds of clouds.
3. Experiment with a glass prism in the sunlight. Compare the colors with a rainbow.
4. Record the varying length of shadows at different times of the day, and their varying directions at different times of the year.
5. Form the habit of noticing seasonal changes in nature and write your observations in a notebook.
6. Learn to read weather recording instruments, weather maps, and weather flags. Visit a weather bureau and note how its records are kept.

Sky Study

1. Keep a calendar record of the phases of the moon.
2. Learn to know some of the constellations.
3. Find directions by the North Star (A-341 picture).
4. Observe one of the planets on successive nights, and mark its position on a chart after each observation.
5. Visit a planetarium or an observatory.

Rocks, Soils, and Minerals

1. Make a collection of rocks and minerals found in your locality. Learn to classify the specimens, and label them.
2. Collect various types of soils in bottles. Label them and give the locality.
3. Plant the same kinds of seeds in clay, in sand, and in loam. Note what happens. Discover outdoors what plants grow best in clay, in sand, and in loam.
4. Study state geological maps and soil maps.
5. Try to find out what stones were used in constructing various buildings and monuments.
6. Try to make arrowheads and tools out of stone as did the Indians (I-67 picture).
7. Start a collection of fossils. Make clay prints of leaves to show how fossils are sometimes formed.
8. Inspect a quarry in operation, and visit a museum to study the rocks and fossils.
9. What can you do to help conservation?

Surface Features of the Earth

1. Study a brook from source to mouth. Note the work of the water in cutting banks and transporting material.
2. If you live in a glaciated region, keep records of evidence of former glacial activity seen on your field trips.
3. Collect newspaper clippings of floods, earthquakes, and volcanic eruptions.
4. Take photographs of land formations, or make a scrapbook to illustrate physical geography using pictures cut from magazines or railroad folders.
5. Try to model various land forms out of plastic clay.
6. Find out what unusual geological features are peculiar to each of the national parks.

II. ORGANIC NATURE—PLANT LIFE: P-234

- A. Trees, Forests, and Lumber: T-130.
 - a. A Year in the Forest: T-134.
 - b. Forests and Forestry: F-154. Tree Surgery T-139.
 - c. Bark: B-46. Lumber L-212.
 - d. Some Common Trees: Alder A-113; Arborvitae A-248; Ash A-323; Beech B-78; Birch B-119; Buckeye B-257; Butternut B-286; Catalpa C-98; Cedar C-121; Chestnut C-184; Chinquapin C-222; Cypress

Trees, Forests, and Lumber

1. Collect various kinds of leaves. Press and mount them in a "leaf book."
2. Make a collection of tree seeds.
3. Place winter twigs in water and watch the buds develop. They can be forced with light and warmth.
4. Make studies of one individual tree throughout the year.
5. Plant a tree seed (acorn, for example) and watch it grow.

Things To Read

C-420; Dogwood D-85; Elder E-213; Elm E-256; Fir F-44; Hawthorn H-247; Hazel H-253; Hemlock H-271; Hickory H-289; Holly H-323; Juniper J-228; Larch L-64; Linden L-148; Locust L-179; Magnolia M-35; Mangrove M-51; Maple M-54; Mountain Ash M-291; Mulberry M-297; Oak O-189; Pecan P-99; Pine P-219; Poplar P-303; Sassafras S-31; Sequoia S-79; Spruce S-264; Sumac S-324; Sycamore S-360; Tulip Tree T-149; Walnut W-5; Willow W-104; Yew Y-206.

e. The Meaning of Arbor Day: A-247.

B. Shrubs and Vines:

a. Some Common Shrubs: Azalea A-408; Blackberry B-152; Blueberry B-159; Cranberry C-391; Gooseberry G-120; Heather H-263; Hydrangea H-366; Jasmine J-202; Laurel L-72; Lilac L-136; Mesquite M-121; Oleander O-221; Raspberry R-51; Rhododendron R-100; Sagebrush S-3; Spirea S-259; Syringa S-362; Witch-Hazel W-128.

b. Some Common Vines: Bittersweet B-151; Clematis C-262; Grape G-135; Honeysuckle H-332; Ivy I-176; Morning-Glory M-259; Passion Flower P-83; Smilax S-29; Trumpet-Vine (Fact-Index); Virginia Creeper V-309; Wistaria W-127.

C. Wild Flowers:

a. The Life and Parts of a Flower: F-120.

b. Some Common Wild Flowers: Anemone A-195; Arbutus A-248; Aster A-338; Bloodroot B-158; Bluebell B-159; Buttercup B-282; Cactus C-10; Columbine C-316; Daisy D-5; Dogtooth Violet D-85; Gentian G-30; Geranium G-60; Ginseng G-88; Goldenrod G-115; Hepatica H-281; Lady's Slipper L-53; Larkspur L-65; Marsh Marigold M-71; May-Apple M-91; Pitcher Plants P-223; Saxifrage S-33; Sundew S-330; Sunflower S-330; Trillium T-140; Violet V-300; Water-Lily W-47.

D. House or Garden Plants:

a. Gardens and Gardening: G-6. Hedges H-269.

b. Bulbs, Tubers, and Rootstocks: B-269.

c. Some Common House or Garden Plants: Agave A-46; Begonia B-85; Camellia C-39; Canna C-72; Carnation C-85; Castor Plant C-95; Chrysanthemum C-231; Cosmos C-373; Cowslip C-387; Crocus C-399; Dahlia D-1; Forget-Me-Not F-159; Fuchsia F-215; Geranium G-60; Gladiolus G-96; Heliotrope H-271; Hollyhock H-323; Hyacinth H-364; Immortelle I-26; Iris I-130; Lily L-136; Lily of the Valley L-137; Marigold M-64; Mignonette M-162; Myrtle M-325; Narcissus N-11; Nasturtium N-13; Orchid O-243; Pansy P-54; Peony P-118; Petunia P-156; Phlox P-173; Pink P-221; Poppy P-304; Primrose P-345; Rose R-156; Sweet Pea S-341; Tuberoses T-148; Tulip T-149; Wandering Jew W-6; Yucca Y-211.

d. Burbank and Some of His Achievements: B-276.

E. Weeds and Flowerless Plants:

a. Weeds: W-64. Dandelion D-9; Grasses G-136; Teazel T-81; Thistle T-81.

b. Poisonous Plants: P-272. Nettle N-75; Nightshade N-145; Poison Ivy I-176; Poison Sumac S-324.

c. Flowerless Plants: Algae A-118; Bacteria B-12; Ferns F-24; Fungi F-218; Lichens L-122; Liverworts L-166; Mosses M-270; Mushrooms M-306; Rusts and Smuts R-199; Seaweed S-72.

F. The Life of Carl von Linné: L-148.

III. ORGANIC NATURE—ANIMAL LIFE: A-199

A. Mammal Study: M-44.

a. Amazing Instances of Animal Behavior: A-202.

b. What Animals Do When Winter Comes: H-288.

c. Familiar Pets: P-153.

d. Domestic Mammals: Cat C-95; Cattle C-101; Dog D-76; Hog H-314; Horse H-341; Sheep S-104.

Things To Do

- Find a bud on a tree in the late autumn, remove the scales carefully, and note the tiny shoot inside.
- Learn to recognize different kinds of lumber.
- Count the annual rings in the cross-section of a stump or log. Correlate with history dates or local happenings.
- Make a census of trees in a selected area. Mark the location and name of each on a map.
- Determine what insect pests are most troublesome to the trees in your city. Learn how to combat them.
- Find out all you can about how the government protects the forests and about the duties of the forest rangers.

Shrubs and Vines

- Make blue-prints of leaves from various shrubs.
- Keep a calendar, noting the date of flowering of ornamental shrubs.
- Select a particular shrub. Make a list of the birds that visit it. What do they do there?
- Visit a nursery where trees and shrubs are grown and propagated.
- Plan a garden, showing the location of trees, shrubs, and vines which you would like to plant.
- Watch the woody plants in your neighborhood and keep records of the dates when leaves begin to turn and when the falling of the leaves begins and ends.

Wild Flowers

- Keep a record of the first appearance of spring wild flowers. Write down the names of those seen, the locality, and the dates when you first saw them.
- Make a complete study, with drawings, of some flowering plant from seed to maturity.
- Prepare an exhibit of wild flower seeds to illustrate methods of seed dispersal.
- Stake out a plot of ground in the fields or woods. Make monthly maps as the season progresses, showing the names and locations of the wild flowers observed there.
- Don't pick wild flowers unless they are very common.

House or Garden Plants

- Construct a window box, planting it with nasturtiums, geraniums, and other flowers; or make a miniature Japanese garden in a shallow bowl for room decoration.
- You can grow plants such as begonia, geranium, and wandering jew from slips and cuttings.
- Cut a tulip or hyacinth bulb in two and find the stem and leaves. Examine a crocus corm. Plant a bed with bulbs that will give a succession of blossoms.
- Learn about sprouting seeds by experimenting with beans, peas, or other seeds grown in moist soil, in sawdust, or even on wet blotting paper.
- Grow flower seeds indoors, using egg-shells for flower pots. When the seedling has developed, chip away the bottom of the shell to allow the roots to emerge, then plant egg-shell and all in the garden.
- Observe the insect visitors of the garden. Which are friends and which are foes?

Weeds and Flowerless Plants

- Spend a rainy afternoon in a hayloft and see how many plants you can identify from their dried remains in the hay.
- Learn to recognize poison ivy and other common poisonous plants. Learn how to tell poisonous mushrooms from edible species (M-306).
- Fern fronds are easily pressed and mounted. Make a collection of dried specimens, or try to make prints of ferns with carbon paper.

Mammal Study

- Begin your study of animals with those nearest you. Observe your pets or those of your friends. Notice differences in feet, fur, teeth, and food habits.
- Observe and record instances of courage, faithfulness, cleverness, and other interesting traits.

Things To Read

- B. Mammals of the Zoo: Z-219. Alpaca A-134; Antelope A-218; Ape A-225; Armadillo A-301; Bear B-67; Bison B-148; Buffalo B-261; Camel C-36; Chimpanzee C-208; Elephant E-244; Giraffe G-91; Gorilla G-123; Hippopotamus H-293; Hyena H-369; Jackal J-177; Jaguar J-181; Kangaroo K-1; Leopard L-98; Lion L-154; Llama L-173; Monkey M-225; Musk Ox M-323; Orang-Utan O-240; Rhinoceros R-94; Seal S-68; Sloth S-164; Tapir T-10; Tiger T-92; Yak Y-203; Zebra Z-216; Zebu Z-216.

C. Mammals in the Wilds of North America:

- a. Big Game Mammals: Pronghorn Antelope A-218; Bear B-67; Bighorn B-108; Caribou C-84; Deer D-35; Lynx L-223; Moose M-257; Puma P-365; Rocky Mountain Goat R-122; Wapiti W-7; Wolf W-128.
- b. Small Mammals of the Forest: Bat B-63; Chipmunk C-222; Fox F-164; Marten M-71; Opossum O-235; Porcupine P-305; Raccoon R-9; Skunk S-157; Squirrel S-265; Weasel W-59; Wolverine W-130.
- c. Small Mammals of the Plains: Badger B-13; Coyote W-128; Gopher G-120; Groundhog G-179; Mole M-216; Mouse M-293; Prairie-Dog P-342; Rabbit H-221; Rat R-51.
- d. Small Mammals of the Waterways: Beaver B-70; Mink M-189; Muskrat M-324; Otter O-255.
- e. The Life of John Burroughs: B-281.

D. Bird Study: B-120, F-20.

- a. Leading Families Among Our Bird People: B-133.
- b. How to Attract and Study Birds: B-141.
- c. Migration of Birds: M-163.
- d. Domestic Birds: Canary C-69; Chicken P-336; Duck D-116; Goose G-119; Parrot P-82; Peacock P-93; Pheasant P-157; Pigeon P-215; Turkey T-158.
- e. Birds of the Trees and Shrubs: Bluebird B-159; Bluejay B-160; Cardinal C-82; Catbird C-98; Chickadee C-198; Creeper N-186; Cuckoo C-413; Finch F-35; Grosbeak G-178; Humming-Bird H-356; Kinglet K-22; Magpie M-36; Mocking-Bird M-212; Nuthatch N-186; Oriole O-250; Robin R-117; Shrike S-135; Sparrow S-238; Starling S-277; Tanager T-8; Thrasher T-85; Thrush T-88; Titmouse T-99; Vireo V-303; Warbler W-7; Waxwing W-58; Whippoorwill W-84; Woodpecker W-134; Wren W-181.
- f. Birds of the Fields: Blackbird B-152; Bobolink B-166; Crow C-402; Grouse G-179; Kingbird K-21; Meadowlark M-95; Quail Q-1; Sparrow S-238; Titlark T-99; Woodcock W-133.
- g. Birds of the Open Air: Flycatcher F-129; Nighthawk N-144; Swallow S-332; Swift S-332; Martin S-332.
- h. Birds of Prey: Buzzard B-288; Eagle E-123; Hawk H-245; Kingfisher K-21; Kite K-26; Owl O-256; Vulture V-336.
- i. Wading Birds: Bittern B-151; Crane S-294; Flamingo F-103; Heron S-294; Plover P-258; Rail R-35; Sandpiper S-173; Snipe S-173; Wood Ibis S-294.
- j. Swimming Birds: Coot R-35; Duck D-116; Gallinule R-35; Gannet G-5; Goose G-119; Grebe G-151; Gull G-185; Loon L-196; Pelican P-103; Swan S-333; Tern G-185.
- k. The Life of John James Audubon: A-363.

E. Fish Study: F-67.

- a. Aquarium: A-233. Goldfish G-115.
- b. Principal Food Fishes of the World: F-74.
- c. Fish Culture: F-76.
- d. Some Common Fresh-Water Fish: Bass B-63; Catfish C-100; Eel E-191; Lamprey L-56; Perch P-122; Stickleback S-289; Sturgeon S-310; Sunfish S-330; Trout T-145; Whitefish W-85.

F. Reptiles (R-78) and Amphibians:

- a. Turtles: T-166.
- b. Snakes: S-169. Copperhead C-361; Moccasin M-212; Rattlesnake R-52; Viper V-302.

Things To Do

Mammals of the Zoo

1. You should visit the zoological gardens as often as you can, and make it a point to be present at one of the feeding periods.
2. Observe in the zoo how deer renew their antlers each year. The picture on page D-37 will show you what to expect at different times of the year.
3. Pay special attention to the young "zoo babies" and notice that some of them are different in color from their parents.

Mammals in the Wilds

1. Encourage the hunting of animals with a camera or field glass rather than with a trap or gun.
2. Become familiar with the game laws of your state.
3. Observe animal tracks in the snow. Learn to distinguish the different kinds, and draw them from your own observations. Plaster casts of tracks in the mud are easy to make.
4. Visit a fur farm if there is one in your neighborhood.
5. What animals in this section are harmful to the farmer's crops? How?
6. What are the natural enemies of these animals?
7. Rabbits and wild mice make interesting pets.
8. Learn to distinguish different kinds of furs.
9. Find out all you can about how different animals care for their young.

Birds

1. Go on bird trips to near-by parks, fields, and woods. The best time to observe birds is during the early morning hours, but, remember, you must be quiet and patient.
2. Learn to identify birds by their songs, calls, and manner of flight, as well as by their shape and color.
3. Keep a bird calendar. Observe the return of birds in the springtime and mark down the dates of the earliest arrivals.
4. Watch for birds' nests on your field trips. Note all the details about the nests and eggs, but do not yield to the temptation of removing the eggs. Keep a record of nesting dates.
5. Observe the habits of some one pair of birds; their manner of nest building, what they eat, their home activities, etc.
6. To form an idea of how many insects are destroyed by birds you must watch a pair feeding their young. Calculate from your own observations the number of insects fed by the parents to their brood during a definite period of time.
7. Put out a bird bath for the summer.
8. Build small bird houses, following the suggestions given on page B-143.
9. Provide a feeding station for winter birds. A shallow tray fastened to a window shelf and furnished with suet, seeds, and bread crumbs usually attracts birds and gives you a chance to get on intimate terms with them.
10. A Christmas tree for birds (an evergreen outdoorss trimmed with food) is a worth-while activity.
11. If interested in bird banding you can get information from the U. S. Biological Survey at Washington, D. C.
12. Become familiar with the laws about bird protection.

Fish, Reptiles, and Amphibians

1. If you have the opportunity, do not fail to visit a government or state fish hatchery and a public aquarium.
2. One of the most delightful of nature hobbies is to keep an aquarium at home. You might begin modestly with a glass jar, but a tank with glass sides cemented into a wooden or metal frame is much better. A "balanced" aquarium, stocked with plants and animals in proper proportion, is the most satisfactory kind to maintain.
3. In the spring collect the egg masses of frogs or toads. Place in an aquarium and watch them develop.
4. A glass globe or discarded fish tank makes a good ter-

Things To Read

- c. Lizards: L-169, C-137b.
- d. Alligators: A-129; Crocodiles: C-398.
- e. Frogs: F-207; Toads: T-100; Salamanders: S-12.
- G. Insects and Spiders: I-81, S-252.
 - a. Some Mysteries of Insect Life: I-91.
 - b. Domestic Insects: Honey-Bee B-73; Silkworm S-144.
 - c. Insect Pests: I-89. Aphid A-226; Army-Worm A-308; Cankerworm C-72; Chinch Bug C-222; Cockroach C-291; Codlin Moth C-294; Cutworm C-418; Flea F-106; Hessian Fly H-287; Housefly F-128; June Bug J-228; Mosquito M-266; Potato-Bug P-326; Scale Insects S-34; Termites A-214.
 - d. Other Insects: Ant A-211; Ant-Lion A-224; Bee B-73; Beetle B-80; Butterfly and Moth B-282; Cicada C-234; Cricket C-397; Dragon-Fly D-88; Firefly F-58; Fly F-129; Grasshopper G-137; Ichneumon Fly I-6; Katydid K-7; Lady-Bug L-53; Mantis M-53; May-Fly M-94; Wasp W-32; Water-Bug W-46.
 - e. Spiders, Mites, and Ticks: S-252, T-12.
 - f. The Life of Jean-Henri Fabre: F-1.
- H. Other Invertebrates:
 - a. Found on Land: Centipede C-131; Earthworm E-136; Slug S-167; Worm W-179.
 - b. Found at the Seashore: Barnacle B-47; Coral C-362; Crab C-388; Jelly-Fish J-209; Lobster L-175; Oyster O-262; Scallop S-35; Sea-Anemone S-66; Sea-Cucumber S-67; Sea-Urchin S-72; Shrimp S-135; Sponge S-260; Starfish S-276.
 - c. Found in Fresh Water: Amoeba A-188; Clam and Mussel C-258; Crawfish C-391; Hydra H-365; Leech L-92; Snail S-167.

Things To Do

rarium for toads, turtles, or small garter snakes. Cover the bottom with a layer of sand, then earth. Add moss, ferns, and other plants. Screen the top.

Insects

1. Collect caterpillars. Put them into an insect cage with leaves such as you find them on. Supply fresh leaves as long as they will eat. Observe the transformations to moths or butterflies, and the intermediate pupal stage.
2. Collect cocoons. Hang them on a plant in the room or keep in the terrarium. Otherwise dip them in water now and then, for they need some moisture. Watch for the emergence of the adult moth.
3. Gather mosquito eggs from stagnant pools. Observe the hatching and transformation of the "wrigglers" in a jar of water.
4. Ant-lion larvae will build their pits in a box of sand. Caddis fly larvae are amusing creatures to keep in an aquarium.
5. Make an ant nest to study ants at home. Consult directions in Lutz's 'Fieldbook of Insects'.

Other Invertebrates

1. Notice how earthworms help to fertilize the soil.
2. Make a collection of shells and label them properly.
3. Some of these creatures make excellent inmates for a terrarium or an aquarium.
4. Many soft-bodied animals can be preserved for an indefinite time in bottles filled with weak formaldehyde (8 to 10 per cent solution).
5. Best of all, study the habits of these animals outdoors. Nature Study is *observation*. The main equipment of a naturalist is a pair of sharp eyes and unlimited patience.

Bibliography for Nature Study

- Patch, E. M. and Howe, H. E. *Nature and Science Readers*, 5v. (Macmillan, 1932-34).
- Persing, E. C. and others. *Elementary Science by Grades*, 6v. (Appleton-Century, 1928-30).
- Picture Books and Books for Easy Reading:
- Aulaire, I. D' and E. P. D'. *Animals Everywhere* (Doubleday, 1940).
- Bass, Florence. *Stories of Plant Life* (Heath, 1912).
- Buck, M. W. *Animals through the Year* (Rand, 1941).
- Daglish, E. F. *Animals in Black and White* (Morrow, 1938).
- Huntington, H. E. *Let's Go to the Seashore* (Doubleday, 1941).
- Kane, H. B. *Tale of the Bullfrog* (Knopf, 1941).
- Kane, H. B. *Tale of the Whitefoot Mouse* (Knopf, 1940).
- Lord, I. E. *Picture Book of Animals* (Macmillan, 1931).
- Patch, E. M. *First Lessons in Nature Study* (Macmillan, 1932).
- Serl, Emma. *In the Animal World* (Silver, 1913).
- Smith, E. B. *The Seashore Book* (Houghton, 1912).
- Wiese, Kurt. *Karoo, the Kangaroo* (Coward, 1929).
- Books for Younger Readers:
- Baer, M. E. *Wonders of Water* (Farrar, 1938).
- Bianco, M. W. *All About Pets* (Macmillan, 1929).
- Boulton, Rudyerd. *Traveling with the Birds* (Donohue, 1933).
- Bronson, W. S. *Children of the Sea* (Harcourt, 1940).
- Bronson, W. S. *Fingerfins; Paddlewings; Pollwiggles Progress*, 3v. (Macmillan, 1930-32).
- Butler, E. L. *Along the Shore* (Reynal, 1930).
- Gall, A. C. and Crew, F. H. *Ringtail; Wagtail; Flattail*, 3v. (Oxford, 1932-35).
- Huey, E. G. *A Child's Story of the Animal World* (Reynal, 1935).
- McKenny, Margaret. *Book of Garden Flowers* (Macmillan, 1941).
- Parker, B. M. *Fishes* (Harper, 1941).
- Patch, E. M. *Holiday Hill; Holiday Meadow; Holiday Pond; Holiday Shore*, 4v. (Macmillan, 1929-35).
- Patch, E. M. and Fenton, C. L. *Mountain Neighbors; Desert Neighbors; Prairie Neighbors; Forest Neighbors*, 4v. (Macmillan, 1936-40).
- Schmidt, K. P. *Homes and Habits of Wild Animals* (Donohue, 1934).
- Shackelford, Shelby. *Now for Creatures!* (Scribner, 1936).
- Books for Older Boys and Girls:
- Andrews, R. C. *This Amazing Planet* (Putnam, 1940).
- Baer, M. E. *Rain or Shine; Story of Weather* (Farrar, 1940).
- Baynes, E. H. *Wild Bird Guests* (Dutton, 1931).
- Carr, W. H. *The Stir of Nature* (Oxford, 1930).
- Chace, L. M. *Look at Life* (Knopf, 1940).
- Beebe, William. *Edge of the Jungle* (Holt, 1921).
- Comstock, A. B. *The Pet Book* (Comstock, 1930).
- Daglish, E. F. *Life Story of Beasts* (Morrow, 1931).
- Devoe, Alan. *Down to Earth* (Coward, 1940).
- Disraeli, Robert. *Seeing the Unseen* (Day, 1939).
- Ditmars, R. L. *Reptiles of the World* (Macmillan, 1933).
- Dorrance, J. G. *Story of the Forest* (Amer. Bk. Co., 1916).
- Du Puy, W. A. *Our Bird Friends and Foes; Our Insect Friends and Foes; Our Plant Friends and Foes*, 3v. (Winston, 1925-30).
- Fabre, J. H. *Life of the Spider* (Dodd, 1913).
- Fenton, C. L. and M. A. *The Rock Book* (Doubleday, 1940).
- Fish, H. D. *Animals of American History* (Stokes, 1939).
- Gaer, Joseph. *Men and Trees* (Harcourt, 1939).
- Kenly, J. C. *Voices from the Grass* (Appleton-Century, 1940).
- King, Eleanor and Pessels, Willmer. *Garden Creatures* (Harper, 1939).
- La Monte, F. R. and Welch, M. H. *Vanishing Wilderness* (Liveright, 1934).
- Lucas, J. M. *The Earth Changes* (Lippincott, 1937).
- Lynch, J. J. *Our Trembling Earth* (Dodd, 1940).
- Mannix, D. P. *The Back-Yard Zoo* (Coward, 1934).
- Mathews, F. S. *Book of Birds for Young People* (Putnam, 1921).
- Mathews, F. S. *Book of Wild Flowers for Young People* (Putnam, 1923).
- Medsker, O. P. *Nature Rambles*, 4v. (Warne, 1931-32).
- Mellen, I. M. *Young Folks' Book of Fishes* (Dodd, 1927).
- Miller, E. B. *Butterfly and Moth Book* (Scribner, 1931).
- Morgan, A. P. *Aquarium Book for Boys and Girls* (Scribner, 1936).
- Morris, P. A. *Nature Photography Around the Year* (Appleton-Century, 1938).
- Moseley, E. L. *Trees, Stars, and Birds* (World Bk. Co., 1935).
- Pack, C. L. and Gill, Tom. *Forests and Mankind* (Macmillan, 1929).
- Rourke, Constance. *Audubon* (Harcourt, 1936).
- Sharp, D. L. *Boys' Life of John Burroughs* (Appleton-Century, 1928).
- Sharp, D. L. *Nature Series*, 4v. (Houghton, 1911-14).
- Shaw, Margaret and Fisher, James. *Animals as Friends and How to Keep Them* (Dutton, 1940).
- Teale, E. W. *Boys' Book of Insects* (Dutton, 1939).
- Thone, F. E. A. *The Microscopic World* (Messner, 1940).
- (See also bibliographies for Astronomy, Birds, Botany, and Zoölogy.)

NAUTILUS. Every schoolboy knows Oliver Wendell Holmes' poem 'The Chambered Nautilus', in which he says—

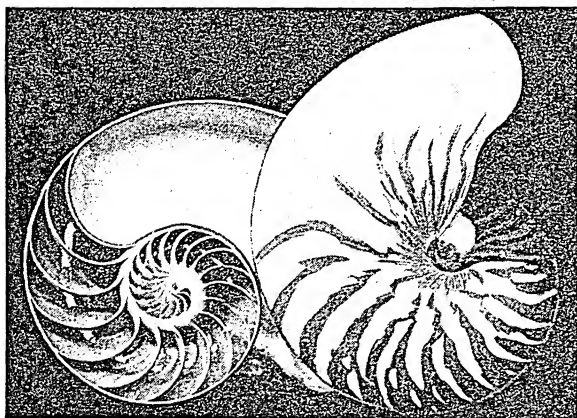
This is the ship of pearl, which,
poets feign,
Sails the unshadowed main,—
The venturous bark that flings
On the sweet summer wind its pur-
pled wings.

But few people know anything definite of the animal about which the poet writes so beautifully.

A "child of the wandering sea," as Dr. Holmes called it, the nautilus lives in the warm waters of the Indian and Pacific oceans, where four species are known. The "ship of pearl" is the shell; the "mansions" are the chambers of the shell, which are made or secreted by the tissues of the animal.

At first the creature lives in a single nearly cylindrical chamber. As it grows, a new chamber is secreted and a partition made between this and the old one. The animal slips forward into the new chamber, leaving behind it only a narrow cord, the "siphuncle," formed from the tissues of the "mantle" of the nautilus. A large number of chambers are formed in the same way, the animal moving forward each time, until a stage is reached when no more chambers form. All the chambers are air-

HOW THE CHAMBERS ARE ARRANGED

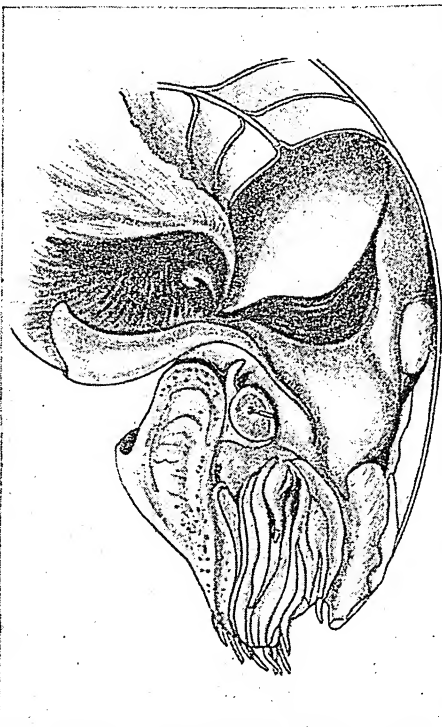


This nautilus shell has been cut in two to show the curious chambered structure. As the creature grows it keeps moving to the front of its shell, sealing up one chamber after another behind it.

tight cavities filled with a nitrogenous gas, and the siphuncle extends through all the chambers into the one first formed. The chambers do not communi-

cate with one another. The living animal cannot ordinarily rise to the surface of the water, but the shell is often found floating after its occupant dies.

THE NAUTILUS IN HIS SHELL



This picture shows the nautilus folded up in the front of his shell, part of which has been cut away so that you can see the structure. At the bottom are the scores of small tentacles, with which the animal catches its food.

The natural position of the nautilus is with the head downward, tentacles spread out, and shell vertical. Nearly a hundred small tentacles, with which its food is caught, are placed on the area surrounding the mouth. None of the tentacles have suckers, but each can be withdrawn into a sheath. When the tentacles are expanded, the head of the animal looks like the open disk of a sea-anemone.

The nautilus is a mollusk of the group called cephalopods. It is peculiar among cephalopods, however, in possessing four gills, the others having only two. Its eyes also are remarkable, for they are constructed on the principle of the "pin-hole camera." The eyes of no other animal are so constructed. They have been described as slightly projecting hemispherical boxes, like kettle drums, a half-inch in diameter. The covering of the eye is not transparent, but like that of the head; in the middle of the structure is a minute hole which permits sea water to enter and fill the eye.

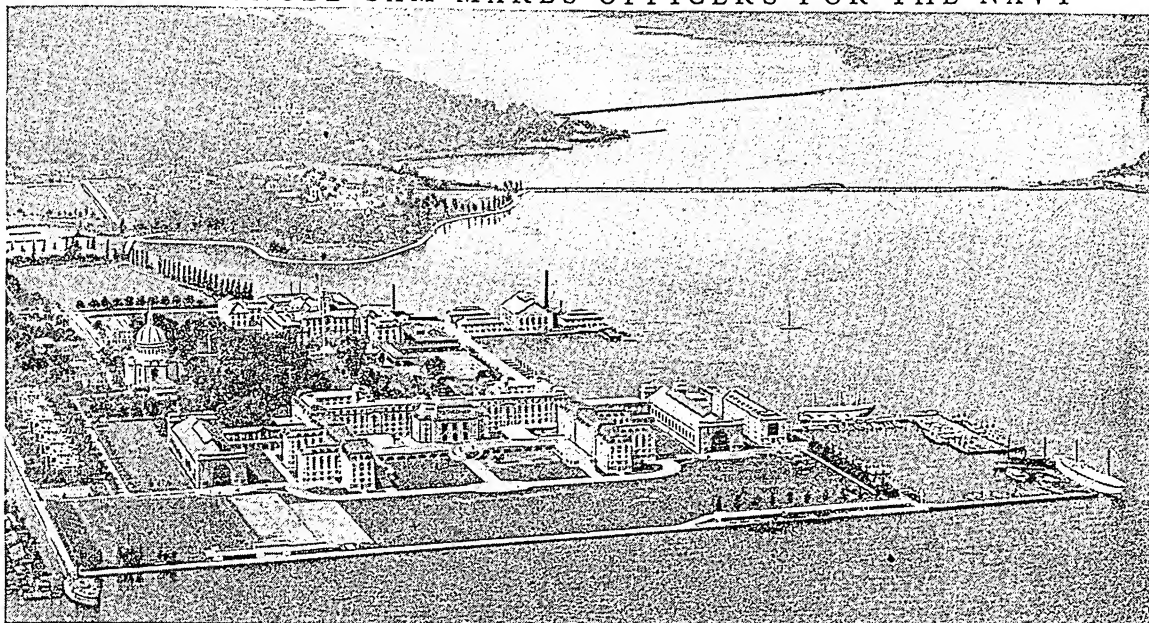
In general appearance and in structure the nautilus resembles its relatives, the octopus, the squid, and the argonaut. In literature, and even in the accounts of naturalists, it is often confused with the argonaut.

NAVAL ACADEMY, UNITED STATES. Officers for the United States Navy are trained in the massive gray buildings of the famous Academy at Annapolis, Md. The Academy was formally opened in 1845 according to plans of George Bancroft, secretary of the navy under President Polk. It is under the supervision of the Bureau of Navigation of the Navy Department.

"June week" is traditional graduation time at the Academy. The campus, along the Severn River, impressive by day, finds added charm at night. The gray buildings loom against the sky, and the clock in the tower shines through the branches of venerable trees.

From your place in the center of the quadrangle, you see midshipmen everywhere. Most of them, in the regular uniform of navy blue, are hurrying past you to the farewell "hop" in the vast gymnasium to the left of Bancroft Hall. You also see cadets, as the midshipmen are still frequently called, strolling along the Severn River docks to your left, where the masts of many little sailboats loom like a tiny forest against the horizon. The administration building lies to your

WHERE UNCLE SAM MAKES OFFICERS FOR THE NAVY



An airplane camera took this view of the Naval Academy at Annapolis. The large building in the foreground is the midshipmen's living quarters, flanked by the Armory and the Gymnasium. The central building in the back row is the Academic Building, with the Chemistry and Marine Engineering buildings on either side. The building with the dome is the Chapel.

right, and also the chapel, where John Paul Jones is buried. Behind you are the academic and the marine engineering buildings. The total number of midshipmen averages about 2,300.

The life of these youths, upon whom the future of the navy depends, is much more strenuous than that of the average university student, and the course of study they must pursue is more rigorous than that of any other college in the country except West Point. Rising at 6:30 with the reveille gun, they have about 25 minutes to dress, form in ranks, and march to breakfast. Afterward they must make their beds and clean their rooms. Alternate study and recitation periods precede lunch and follow it, until the late afternoon drill period. After the march to dinner there is a long study period, with "taps" or "lights out!" at 10:15.

In their first year at the Academy, these youths—as "plebes"—start the rigid drills which continue throughout the eight months of each academic year—rowing, sailing, infantry, artillery, boxing, dancing, fencing, and swimming. They study mathematics, chemistry, mechanical drawing, English, and a foreign language. The next year, as "youngsters," they con-

tinue these studies, adding naval history, electrical engineering, and physics. In the third and fourth years they study seamanship and navigation, ordnance and gunnery, and naval construction. At the end of the second year they receive aviation instruction; at the end of the first and third years they are sent to

sea for practise cruises. The four-year course may be shortened in times of emergency. Graduates receive the Bachelor of Science degree. Most of them are commissioned as ensigns in the United States Navy and a limited number as second lieutenants in the Marine Corps.

In training are young men from every part of the United States and its possessions, and from every walk of life. The majority are appointed by senators, representatives, and delegates to Congress—each of whom may appoint 5. The vice-president also appoints 5. The president ap-

points 5 from the District of Columbia; 25 from the country at large; 40 sons of veterans killed or injured in service; 5 from Puerto Rico; and 20 from the Latin American republics. The secretary of the navy appoints 100 enlisted men from the Navy and Marine Corps and 100 from the Naval and Marine Corps Reserves; 20 honor graduates from certain schools; one from the Canal Zone. The foregoing numbers vary occasionally. Candidates must be between 17 and 21 years of age and must pass rigorous physical tests. Midshipmen are paid \$780 a year to defray their incidental expenses.

RULES FOR MIDSHIPMEN

A superintendent of the Naval Academy drew up the following rules designed to meet the needs of lads in the naval service:

*Do your day's work every day.
Strive to make 100 per cent in everything you undertake.
Obey orders cheerfully, honestly, and conscientiously.
Do your full duty on time, all the time.
Practise self-control and self-denial.
Be considerate of others. Be helpful and cheerful and courteous.
Don't be a "growler" or a "sea-lawyer" or a "drifter" or a "dud."
Be true to yourself, to your mess-mates, to your task.
Be true to the great naval service to which it is your priceless privilege to belong.
Always steer a straight course and answer with a cheerful "aye, aye, sir!"
Be a man and never say die.*

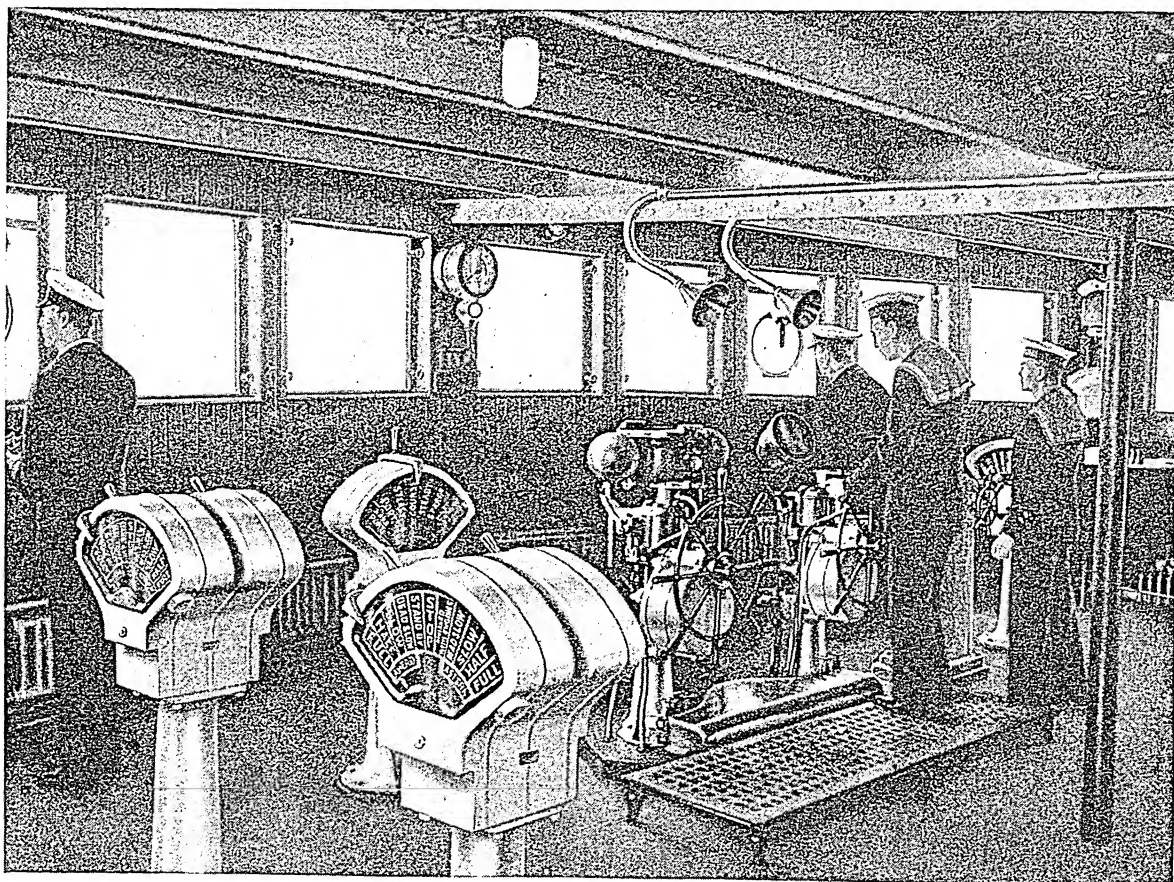
NAVIGATION. How does the navigator find his way across the trackless ocean, out of sight of land for perhaps weeks or months at a time? Maps and charts tell him the position of the port he has left and the port he wishes to reach; and on a perfectly calm sea it would be possible to steer his course with simply a compass to guide him. But ocean currents and strong winds deflect the ship from its course; and it is necessary to re-determine its position (that is, its latitude and longitude) two or three times a day.

The determination of latitude can be arrived at accurately by astronomical observations—generally of the sun, but also of the fixed stars. The chief instrument now used is the sextant, a contrivance for measuring the altitude (angular height above the horizon) of the sun or any other heavenly body. The sun is not equally high in different latitudes; and by measuring how high it is on any particular date at noon, the navigator can compute by means of an almanac how far he is from the equator. The sextant, which permits accurate measurement of angles, was

invented in its original form by John Hadley in 1731. Its use is explained on a later page. When thick weather obscures the horizon, the instrument can still be held in a horizontal position by using a small spirit level, called an *artificial horizon*.

In the northern hemisphere, the height of the pole star above the horizon, with minor corrections, equals the latitude of the observer. Latitude can also be determined from the sun when it is at its highest, or at apparent noon, by measuring the angle between the sun and the horizon. This angle, corrected for local conditions, is subtracted from 90° , thus giving the angle from the *zenith*, or point directly over the observer. This is again corrected for the position of the sun relative to the equator on that day, as obtained from a nautical almanac, and the result is the latitude. Longitude is found by comparing the local time with a chronometer set to Greenwich time. Let us suppose that when the sun is in the noon position, this clock shows exactly 6 o'clock in the morning. Therefore, the ship is distant from Greenwich meridian

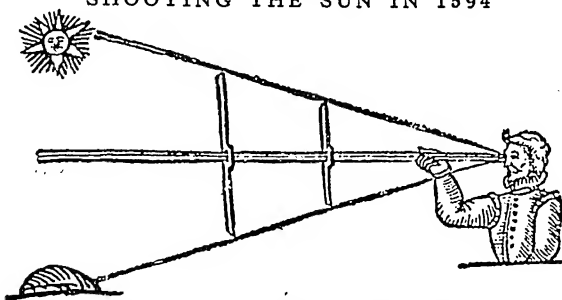
GUIDING A SHIP ACROSS THE TRACKLESS OCEAN



Here we get a glimpse inside the wheelhouse of a great liner just putting out to sea. The helmsman, whose official title is quartermaster, stands at the wheel with an emergency wheel at his left. In front of him is the magnetic compass. To his right is a relief quartermaster, and in front of this man is the gyro-pilot control box with a small wheel for setting it. The gyro-pilot will take over the steering once the ship is on its course out in the open sea. Beyond the helmsman stands the senior

watch officer. He is looking through the "clear-vision window"—a whirling disk of glass which throws off snow or rain. At the extreme left stands the junior watch officer. In the immediate foreground are two telegraphs to signal the engine room and beyond them a telegraph to the emergency steering room in the stern of the ship. Hanging from the ceiling are speaking tubes for communicating with the officers on the bridge and in the engine room. On the forward wall is an engine-speed indicator.

SHOOTING THE SUN IN 1594



In using the Cross-staff, the observer sighted from the base of the staff to the tip of the farther cross-piece, which he adjusted to coincide with the sun and the horizon. The angular distance was then read off from a scale marked on the staff. This illustration is from an old book, 'The Seaman's Secrets', by John Davis, published in 1594.

by an angle equal to six hours of time. Since the earth turns from west to east, the ship is *east* of Greenwich, because time is earlier in the east. Since the earth's rotation is 15° per hour, and the difference in time is six hours, the distance is 6×15 , or 90° east.

Since the determination of longitude depends on the accurate keeping of time, early navigators were often hundreds of miles in error in their reckoning. The common method of sailing was to run to the known latitude of the destination, and then sail east or west until land was reached.

With the increasing importance of shipping, and the growth of trade between maritime nations, the loss of valuable ships and their cargoes because of errors in longitude became such a serious matter that the British government in 1714 offered a prize of £20,000 to the first person to demonstrate a method of determining longitude to within 30 miles after having been at sea for six months.

The Chronometer

John Harrison, a carpenter who had taught himself watch-making as a hobby, won the reward in 1765 by constructing an exceedingly accurate ship's clock, or *chronometer*, with a temperature-compensating balance, and a new escapement (see *Watches and Clocks*). Harrison's invention was later perfected by Le Roy of Paris, who built chronometers substantially the same as the wonderfully accurate instruments of today.

Modern ships carry at least three chronometers,

mounted in gimbals to compensate for movement of the ship. If one instrument goes wrong, the error will be revealed by the other two. The best modern chronometer will keep time for six months with an error of not more than a second a day.

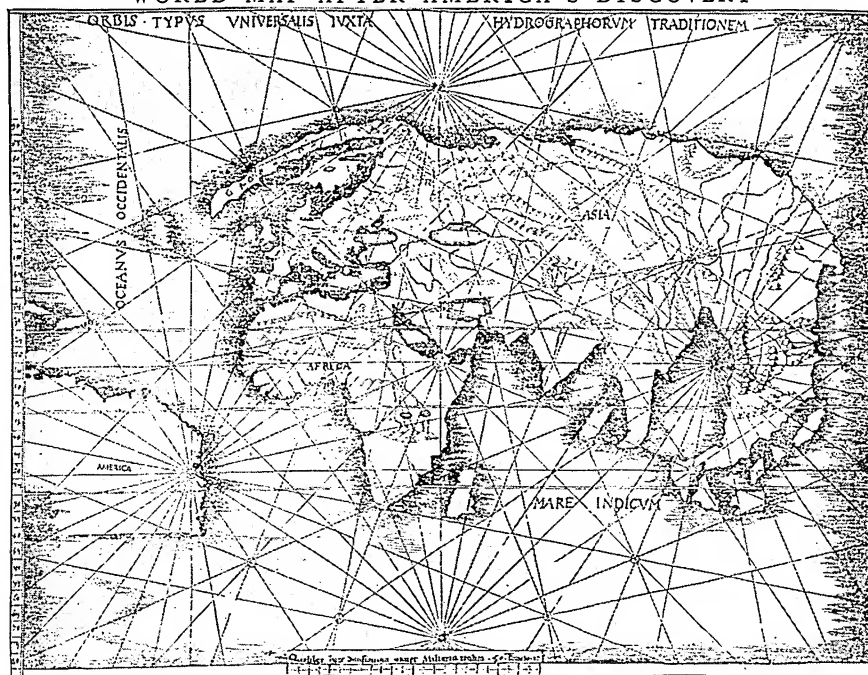
Radio Aids to Navigation

Nowadays ships receive radio time signals at frequent intervals, thus checking their chronometers against observatories ashore. The radio signals are accurate to within $\frac{1}{100}$ of a second. Radio offers other invaluable services to the navigator. Radio beacons dot the coasts of principal countries, as well as the Great Lakes. Some stations report a ship's position on request; others automatically send out characteristic identifying signals at regular intervals. (See *Radio*.)

When the weather does not permit astronomical observations, the position of the ship may be found by "dead reckoning." The navigator knows by his last astronomic observation where his ship was at a certain time before; by means of his compass he has kept a record of the direction in which he has steered; and by means of a patent log or an engine revolution counter he can learn the speed and distance he has traveled (see *Log, Ship's*). The estimated position, as shown by a dot on the chart, is marked "est." or "D.R." for the estimated or "dead reckoning" position. Later, when a chance occurs to make an astronomical observation, the proper position thus found is also plotted.

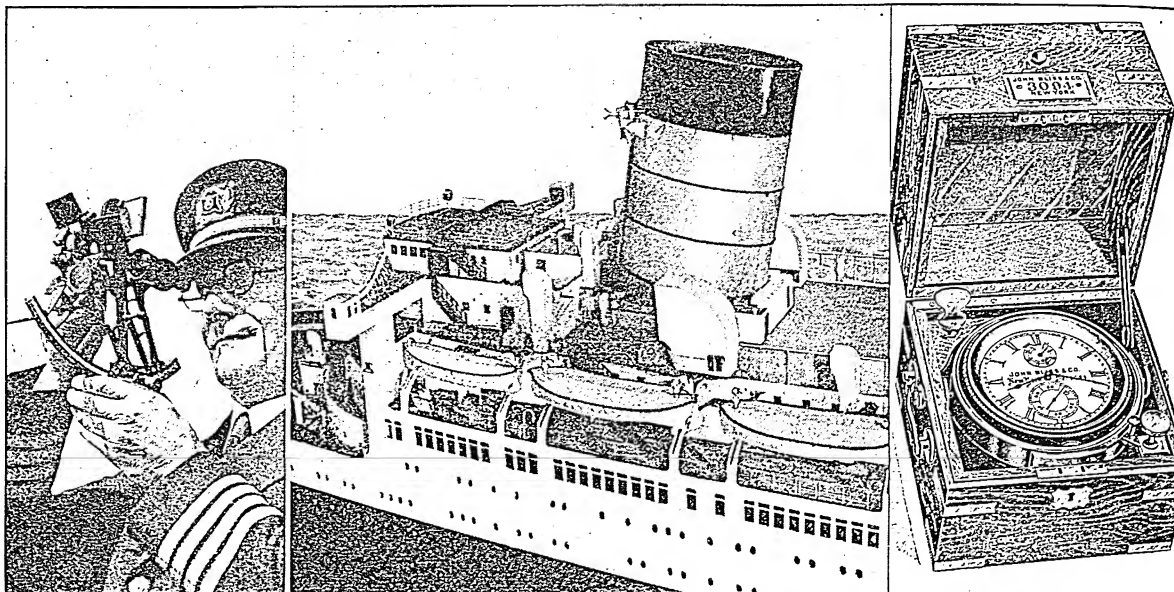
The magnetic compass is found on every vessel except submarines, where its enclosure within a steel hull renders it useless (see *Compass, Magnetic*). It is

WORLD MAP AFTER AMERICA'S DISCOVERY



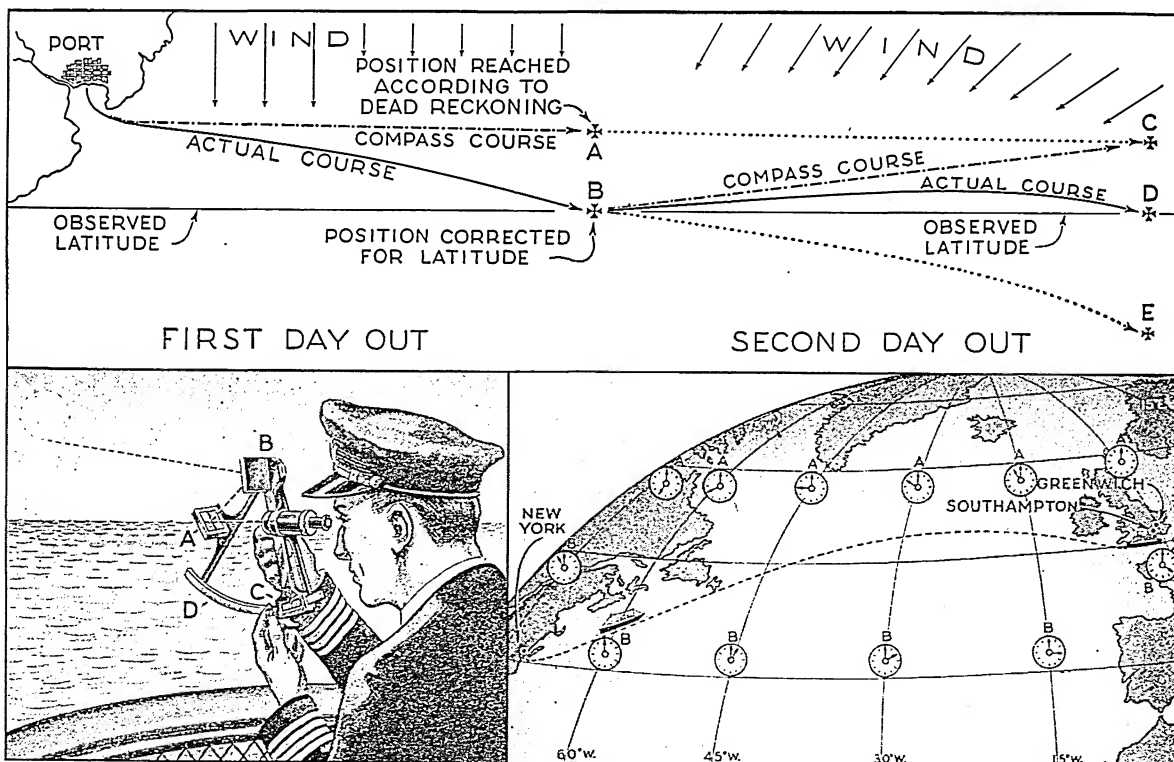
This chart, the original of which is in the John Carter Brown Library at Providence, R. I., was made in 1506 by Martin Waldseemüller and is said to be the first to show the name 'America'.

HOW THE NAVIGATOR FINDS HIS WAY AT SEA



The picture in the middle shows the navigating center of the steamship *Queen Mary*. The chartroom and the wheelhouse are on the bridge deck, ahead of the funnel. Above them is the open signal deck. The bridge on each side ends in a shelter or wind-

break, which is built out over the water to give a clear view along the ship's side. The left-hand picture shows an officer using a sextant, and a chronometer is shown at the right. The use of these instruments in setting a ship's course is explained below.



The upper diagram illustrates a part of a ship's course in practical navigation. The ship leaves port, sailing east toward point C. The captain's first latitude observation shows, however, that instead of reaching A, on the true compass course, the ship has been blown off course to B. The captain now lays a new course to reach C, but next day finds himself at D instead. The error, however, is small; whereas if he had not altered his course the day before, the ship would have reached E. By such repeated corrections a ship is kept on the desired course. At the lower left we see how the sextant is used to determine latitude. First, the officer sights on the horizon through the *unsilvered* half of the mirror. Second, he moves arm C until the upper mirror, B,

which is attached to C, throws an image of the sun upon the *silvered* half of A. Third, he reads the altitude of the sun above the horizon as indicated on scale D by the pointer on C. From this, the officer computes the latitude, as explained in the text. At the lower right we see two examples of how a ship's local time, when compared to Greenwich time, establishes the longitude of a ship's position. The row of clocks marked A show the local time every 15 degrees westward when it is noon at Greenwich. The row of clocks marked B show an identical comparison when it is 4 o'clock at Greenwich. If, for example, it is noon by the sun when the Greenwich chronometer says 4 o'clock, then the ship has reached the 60th meridian west.

used, however, merely as a reserve instrument on ships which carry a gyrocompass (see Gyroscope).

Maritime nations furnish navigators with minutely accurate maps, or charts. These charts show every detail of the shore line, the character of the bottom, the depth of water, the location of every obstacle, and prominent objects along the coasts to help navigators locate their positions.

In addition to the age-old "lead line" with its lead weight and a cord tied with cloth markers at each fathom (six feet), well-equipped ships carry automatic sounding machines. These machines measure the depth of water beneath the ship hundreds of times an hour (see Ocean). The hand lead line is still used in shallow water, with a piece of soap or tallow in a recess in the bottom of the lead to bring up a sample of the earth on the bottom. This information frequently gives a navigator his position, even in a fog. Lighthouses, lightships, buoys, and beacons are important along coasts (see Lighthouses and Lightships).

Great-Circle Sailing

To sail by compass from New York to Bishop Rock, the landfall off Lands End, England, a navigator could steer steadily east by north. But this would not be the shortest voyage possible, because the shortest course follows the *great circle* between these points. A great circle is the circumference of a circle which passes along the earth's surface through the desired points, and has its center at the center of the earth, as shown in the diagram above. Such great-circle courses agree with compass courses between ports only when sailing due north or south, or along the Equator, since meridians and the Equator are great circles.

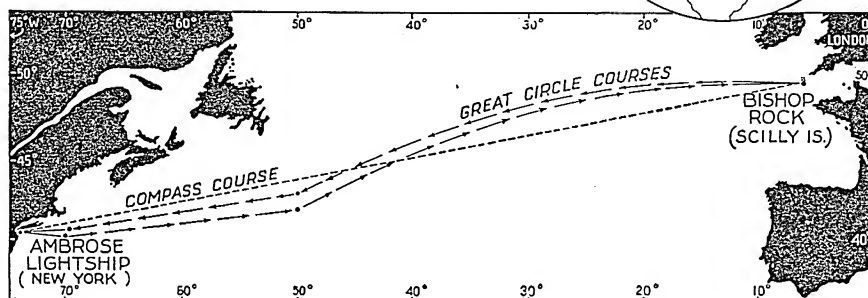
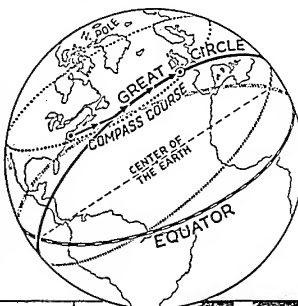
In order to keep ships clear of the New England coast, the great-circle tracks in the North Atlantic start and end, not at New York harbor, but at longitude 50° W. There the tracks are separated by one degree, or about 69 statute miles; and from there on eastbound and westbound ships follow separate tracks, to prevent collisions in storm or fog. Both tracks are shifted southward when icebergs are adrift, and northward to achieve shorter voyages when the ocean is ice-free.

The History of Navigation

Since the dawn of civilization, men have been sailing in ships (see

GREAT-CIRCLE SAILING

At the right are both the compass course and the great-circle course between New York and the English Channel. As the text explains, the great-circle course is shorter. The diagram below shows the separate tracks followed by eastbound and westbound ships as they appear when laid down on a navigator's chart. Additional features are explained in the text.



Boats and Boating; Ships). The leading mariners of ancient times were the Sumerians, the Cretans, the Egyptians, the Phoenicians, and the Greeks (see Aegean Civilization; Phoenicians).

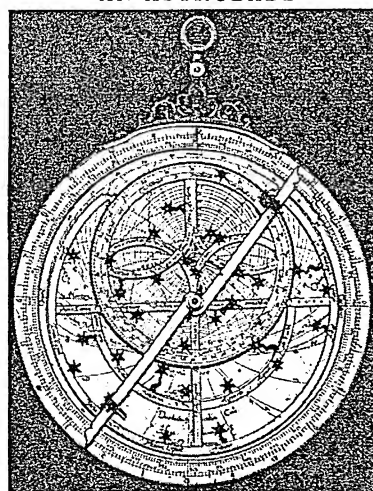
In early ancient times sailing consisted largely of "coasting." Rowing galleys moved from landmark to landmark, and from harbor to harbor, along the coast. Often the crews beached the boat at night, to get fresh water, cook meals, and rest.

The Phoenicians and the Greeks learned how to navigate out of sight of land, by taking direction from the sun by day, and from the stars at night. These mariners knew also that the higher the Pole Star, Polaris, stood above the horizon, the farther north they were. The Greeks developed the cross-staff and the astrolabe for making astronomical observations, and learned the latitude of many cities by measuring the height of the Pole Star.

The *cross-staff* was a stick or staff about a yard long, with a shorter sliding stick set at right angles to the staff. To make an observation, the navigator pointed the staff approximately at the halfway point between the horizon and the sun or a star. He then moved the crossbar until the sights at its ends touched the observed body and the horizon. A scale placed along the staff showed the angle, or height, of the observed body.

The *astrolabe* was a circular plate of brass or bronze, from 4 to 20 inches in diameter. A pointer called an *alidade* was pivoted at the center

AN ASTROLABE



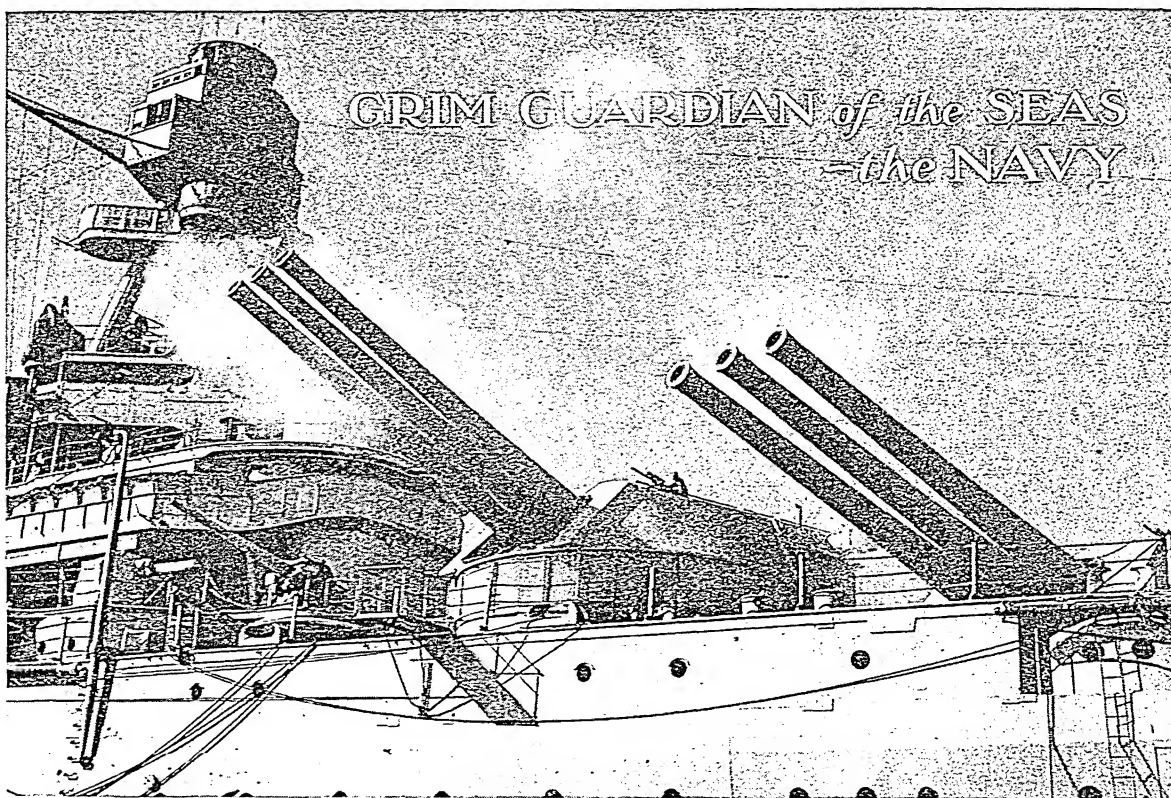
The diagonal bars form the alidade, or "pointer." The other parts were used to calculate the time of day. This instrument is in the Adler Planetarium, Chicago.

of the plate. One person held the astrolabe suspended vertically by a small ring, while another pointed the alidade at a star or the sun. The observer could then read the angle from marks on the plate.

The next great aid to navigation was the *magnetic compass*. This came into common use in the Mediterranean by the 12th century (*see* Compass, Magnetic). At this time, the peoples of northwestern Europe had become active sea traders on the Baltic Sea and the North Sea, and along the Atlantic coast to the Mediterranean. To enable their ships to withstand the storms of these rough waters, they deepened the keels, which had been known since ancient times, to keep ships from rolling over in high winds and stormy seas. They added improvements such as the rudder (*see* Ships); and they

carried water in tight-lidded casks instead of jars or skins. This kept down animal and vegetable growths which made the water unfit to drink on long voyages. The Italians also learned to make a good chart, called a *portolano*, in place of crude medieval maps.

Columbus carried both the cross-staff and the astrolabe on his great voyages, and he had a fairly good almanac to help in making calculations of position from observations on the sun and the stars. His instruments were too crude, however, to determine latitude within less than 50 or 100 miles, and longitude could not be fixed reliably within hundreds of miles. Invention of the sextant and the chronometer in the 18th century completed the essentials needed for accurate navigation. Later additions such as radio aids are simply refinements upon these essentials.



This picture of the battleship *Pennsylvania* shows the two forward turrets, with six of the twelve mighty guns in the main battery and one of the 5-inch guns. Above the small gun is the heavily armored conning tower for the commander, and at the extreme left rises the navigating and directing "brain center" of the ship, topped by the lofty fire-control station.

NAVY. In time of war the United States must think first of all of its strength far out on the surrounding oceans. Any enemy would have to attack with ships and airplanes. The place to beat off the attack is far at sea, before harm is done to the homeland. So also, to defeat any enemy, the United States must carry its attack overseas to strike the enemy in his homeland. To do this it must command the sea in order to transport its forces, and seize bases for use in carrying the war to the enemy. Meantime the enemy, by entering into war, will have exposed its own com-

merce and territory to grave risk because of American command of the sea.

For these reasons, the United States maintains first-rank strength at sea. Its policy, as officially stated, is "to maintain the Navy in strength and readiness to uphold national policies and interests and to guard the United States and its continental and overseas possessions."

In addition to being the cornerstone of the national defense, the United States Navy performs many invaluable peacetime services. It aids navigation and

seaborne commerce; it administers outlying possessions; and it gives help in times of earthquakes, floods, and similar disasters. (For an account of these services, *see* United States Government, subhead, The Department of the Navy.)

The Regular Navy and the Reserve

When the United States was plunged into war in December 1941, the Navy was engaged in a recruiting and training program to produce a strength of 460,000 men and 33,000 officers, including 104,000 in the Marine Corps and about half as many in the Coast Guard. This strength was intended to man a two-ocean navy of about 700 vessels. Further increases were authorized in 1942, and the ultimate strength in officers and men was expected to be about one million.

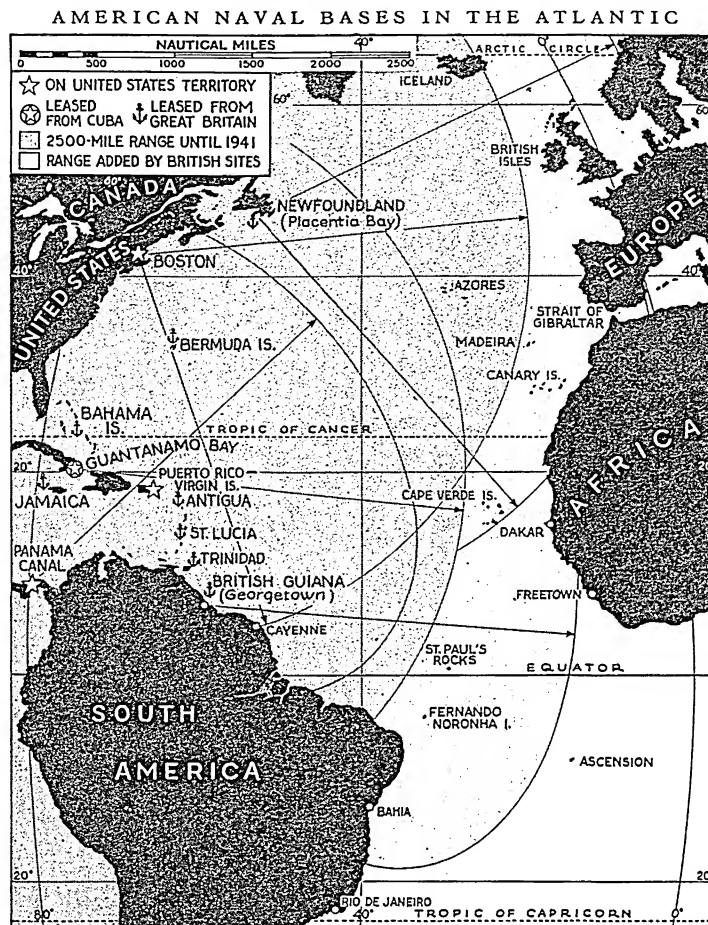
The Navy makes a part of such increases by enlarging its full-time strength. The rest of the increase is obtained by calling upon various classes of officers and men in the United States Naval Reserve, a force which serves only in emergencies and in war.

One of the classes in this force is the Fleet Naval Reserve, formed from the old Naval Militia in various states. When not in active service, this force has one armory drill a week and two weeks of active duty every summer. A second group, containing officers and men not organized into units, is the Volunteer Naval Reserve. Its members are used to fill out or enlarge the organized forces. The Merchant Marine Naval Reserve is recruited from officers and men serving on merchant vessels. The "transferred" Naval Reserve consists of men, chiefly petty officers, who have retired from active duty. In time of war, the Coast Guard passes under command of the Navy (*see* Coast Guard). The Marine Corps also has its reserve organizations.

Some officers for the Reserves are obtained by transfer or retirement from active duty in the Navy. Many junior officers are obtained from units of the Reserve Officers' Training Corps in various universities. In times of emergency, civilians are commissioned after four months of training. Enlisted men may be commissioned after passing examinations.

1. Problems of United States Naval Strategy

IN TIME of war the Navy may be called upon to establish the all-important command of the sea in either the Atlantic Ocean, the Pacific Ocean, or both. Before the outbreak of war in Europe in 1939, the international situation did not seem to require a strong fleet in *each* ocean, because



The heavily shaded sector on this map shows the operating range of the United States Fleet in the Atlantic before September 1940. Every point in it lay within 2,500 nautical miles of some American base. Boston is used as typical of the bases in the continental United States. The lighter shading shows how the range was extended to northwestern Europe, Gibraltar, and northern Africa when the United States gained the right to use British sites for bases.

one fleet could be shifted from ocean to ocean through the Panama Canal as needed. But by 1940 it became evident that the Navy might have to fight in both oceans at the same time. Congress therefore authorized construction of a two-ocean navy of about 700 vessels of all types, to be completed in 1946. Pending completion of this force, the Navy was organized on Jan. 8, 1941, into three subdivisions—the Pacific Fleet, the Atlantic Fleet, and the Asiatic Fleet. Each fleet was responsible for its area, but the battle strength needed for a first-rank fleet action was concentrated in the Pacific force. This fleet was to deal with any enemy battle fleet which might appear, moving through the Panama Canal if necessary. Thus the canal is the geographic keystone of American naval strategy (*see* Panama Canal).

For operations at sea, the Navy's fundamental unit is the surface ship. It uses airplanes and submarines freely, but these cannot replace the surface vessel. For one thing, they may be made ineffective by bad weather, whereas surface ships can operate in all

weathers. Again, airplanes and submarines cannot carry the enormous tonnages which are needed for overland operations against an enemy. Only surface ships can do this. Finally, surface vessels have much greater range than either airplanes or most submarines. These other fighters can operate far at sea only if they can get supplies from surface vessels.

This need for supplies also makes it difficult for a battle fleet to fight more than 2,500 nautical miles from a base. Many older types of vessel are limited to this range, and a fleet cannot go farther from its base, if it is to have its full strength. Hence a navy needs bases about 2,500 miles apart, along its lines of operations. These bases also lend powerful help in preventing air raids.

When the United States went to war in 1941, it was reasonably well provided with bases in the Atlantic, and it had enough for defense in the Pacific.

Atlantic and Caribbean Naval Bases

On the Atlantic coast, the Navy has four major naval bases, at Boston, New York, Philadelphia, and Norfolk. But the most important area in the Atlantic region for naval defense is the Caribbean Sea. This sea, enclosed on the south and west by the mainland of South and Central America, forms a sort of antechamber to the Panama Canal. From positions in the eastern fringe of islands, all access to the Caribbean from Europe, Africa, or North America can be controlled. (See Caribbean Sea.)

The principal American naval base in the Caribbean area is at Guantanamo Bay, Cuba. This base is leased from the Cuban government. It controls the Wind-

ward Passage, the main opening into the Caribbean from the Atlantic. Other bases are maintained in Puerto Rico and the Virgin Islands.

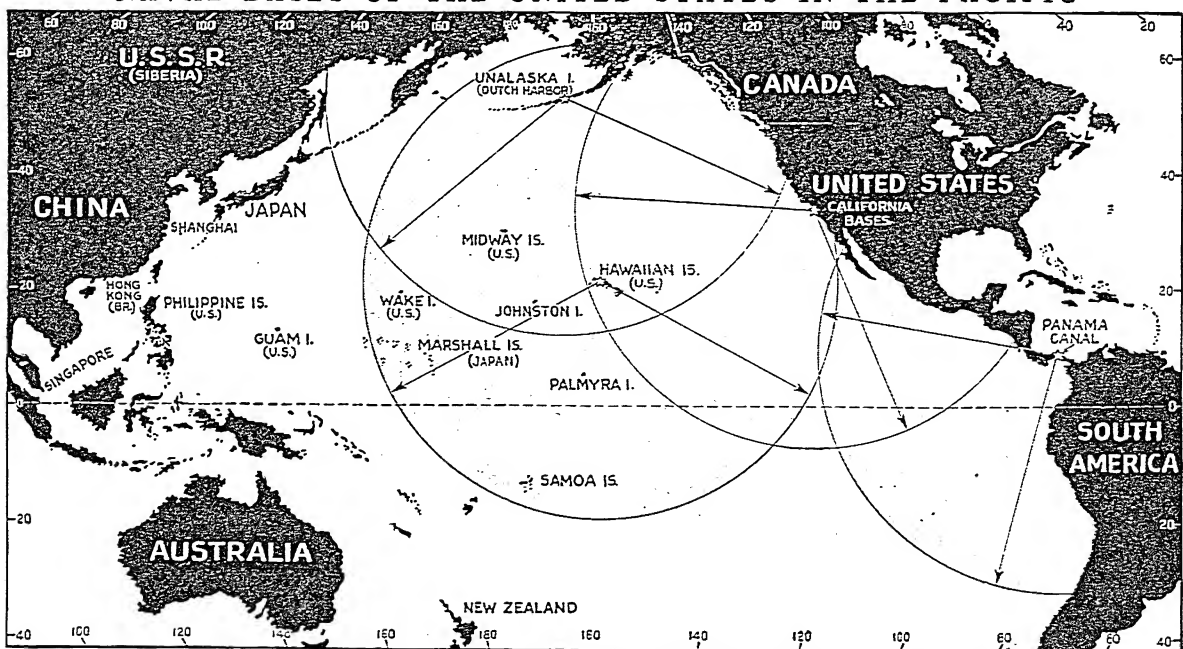
In September 1940 the United States improved its strategic situation by acquiring from Great Britain sites for bases ranging from Newfoundland to South America. In 1941 bases were established in Greenland and Iceland, and after the United States entered the war the British Isles were open to the Navy. Seizure of French North Africa in November 1942 secured bases at Oran, Dakar, and elsewhere. Thus the operating range was extended to the Russian Arctic coast, the Mediterranean, and into the South Atlantic.

Naval Bases in the Pacific

At the outbreak of war, the United States had several Pacific outposts. The key to the system was the base at Pearl Harbor, on the island of Oahu in the Hawaiian archipelago. Behind this, on the United States mainland, the Navy had major bases at Bremerton in Puget Sound, on Mare Island in San Francisco Bay, at San Pedro (Los Angeles), and at San Diego. To the southeast was the Panama Canal Zone, with a submarine and naval aviation base at Coco Solo, near Colon.

The Navy also had many small islands, which could be used by airplanes and light vessels. These supporting positions began in the north at Kodiak Island, on the Alaskan coast. They stretched by way of Dutch Harbor on Unalaska Island, and Midway, Johnston, and Palmyra islands, to Samoa in the South Pacific. Wake Island and Guam provided landing places on a route to Asia, and an outlying base existed at Cavite in the Philippines; but these were quickly lost.

NAVAL BASES OF THE UNITED STATES IN THE PACIFIC



The shaded area around the Hawaiian Islands shows how the base at Pearl Harbor, on the island of Oahu, is the keystone of United States naval operations in the Pacific Ocean. The Panama Canal is the key to transfer of strength between the Atlantic and the Pacific oceans. Each of the areas around these bases is drawn with a radius of 2,500 nautical miles. This is considered the normal operating range of a fleet, as explained in the text. The map also shows supporting positions on the Pacific coast and islands which light vessels and airplanes can use as bases. Together these positions cover the coast completely. As long as they are held securely, no other fleet can operate against the United States from good bases in the Pacific.

2. Fighting Tactics of the Navy

THE ULTIMATE PURPOSE of a navy—to command the sea in wartime—requires skilful combination of the fighting powers of airplanes, submarines, and surface ships. The surface ships are subdivided into special types. Some support airplanes and submarines; others protect friendly cargo carriers and troop transports, and attack those of the enemy. Still others deal with heavy fighters of the enemy's main fleet. But all these specialized types are alike in one particular. They all use *fire power*—that is, explosive missiles—to accomplish their missions.

Every fleet tries, therefore, to crush its enemy by delivering superior fire power. Airplanes may lead in this, and submarines aid under the surface. The final blows are delivered by guns of surface vessels, until the enemy has been swept from the sea. The object of naval tactics, therefore, is to bring into action greater gun power (commonly called "weight of metal") than the enemy can, meanwhile using bombs and torpedoes as effectively as possible, and trying to lure or drive the enemy into areas sown with mines.

In addition to fire power, the fighting force must also have *staying power*, or ability to withstand punishment while fighting a battle, and *speed*. If a fleet could not overtake its enemy, an inferior force might be able to stay at sea indefinitely by simply running whenever it found itself in danger.

But all three elements cannot be combined in the same ship. If maximum gun power is provided, either armor, engines, or amount of fuel carried must be lessened. If both gun power and speed are desired, protection must be drastically reduced. Every navy therefore develops several classes of ships. The ships which have gun power and armor enough to engage in battle with an enemy fleet are distinguished from the others as *capital ships*.

The United States Fleet and Its Subdivisions

In the American Navy the various fighting ships are organized into one great unit, the United States Fleet. In peace and war alike, the fleet is commanded by an admiral who is called the Commander in Chief, United States Fleet. The fleet consists of seven parts: (1) Battle Force; (2) Scouting Force; (3) Submarine Force; (4) Base Force; (5) Fleet Force of Marines; (6) Atlantic Fleet; (7) Asiatic Fleet.

In a naval campaign, the fleet would be led into action by the Scouting Force. This force locates the enemy forces and compels lighter craft to seek protection from their heavy fighting vessels. Thus it gives the Battle Force its opportunity to destroy the enemy's strength in one decisive battle.

The Scouting Force entrusts its most far-flung search for the enemy to *patrol airplanes*. These are organized into squadrons of six, nine, or twelve planes each, and wings of two or more squadrons. On the surface, destroyers range far and wide, combating similar enemy craft and submarines. Heavy cruisers back them up and drive the enemy's scouting force back to its main fleet. Then the Battle Force comes into action.

The Battle Force includes: (1) the battleship divisions; (2) a force of light cruisers; (3) aircraft carriers; (4) destroyers; and (5) mincraft. Battleships are organized into divisions of three or four ships each. Cruisers are organized on the same principle. Carriers form divisions of two or three ships each. Destroyer divisions have four ships. They are grouped into squadrons consisting of a destroyer leader and two or three divisions. Squadrons in turn are grouped into flotillas of two or three squadrons, with a light cruiser as flagship.

3. The Backbone of the Fleet—the Battleship

BATTLESHIPS are the backbone of a fighting fleet. Their chief characteristics are heavy armament and stout protection.

They must be able both to give and to endure the tremendous blows which the naval weapons of today can inflict. This ability to maintain *sustained battle* makes them the decisive element in fleet fighting.

Battleships are the giants of the fleet. After the World War of 1914-1918, the average battleship displaced about 30,000 tons. When Germany and Japan started new naval building in the early 1930's, a trend set in toward even greater size, with displacements of about 35,000 tons. The United States authorized six such craft, to cost about \$75,000,000 each. In 1939 Congress provided funds for starting construction of two 45,000-ton battleships. Each was to cost more than \$80,000,000. In 1940 a program was authorized to provide a total strength of 1,045,000 tons of battleships by 1946, or from 32 to 35 ships.

The main armament of a battleship consists of heavy guns, mounted in pairs, threes, or even fours, in armored turrets. The turrets, placed on the centerline of the ship, can be revolved so that the whole main battery can be brought to bear on either side, and part of it can fire ahead or astern.

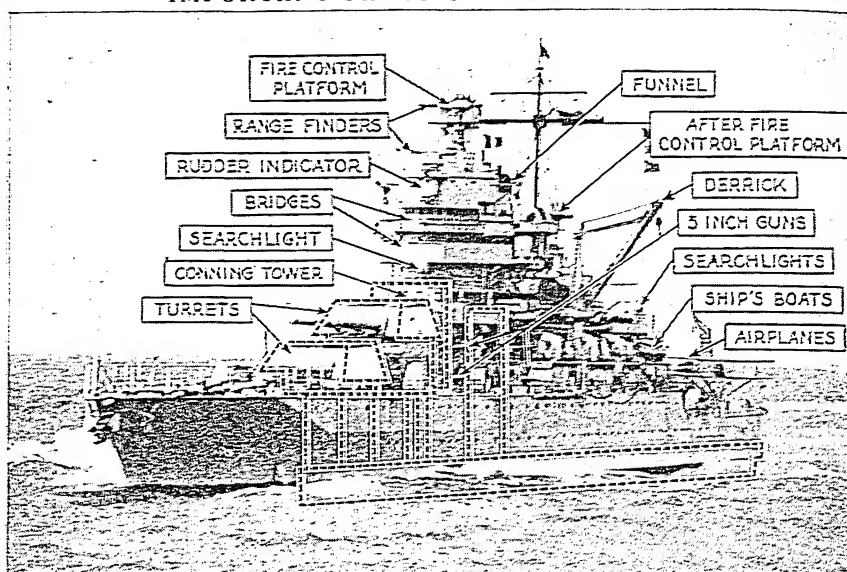
The Fire Power of a Battleship

Most American battleships carry a main battery of ten or twelve 14-inch guns, or eight 16-inch guns. The newest ships are designed to carry nine 16-inch guns. Battleships also carry a secondary battery of 5-inch guns. In the newer vessels these are mounted in turrets, and can be fired vertically against aircraft or horizontally against surface craft.

Figures set down in cold black and white give only a faint idea of the power of a modern battleship. The U. S. S. *North Carolina*, for example, can fire nine 16-inch guns in one discharge, or "broadside." This means that one broadside sends more than ten tons of steel and high explosive screaming through the air to distances as great as 35,000 yards (nearly 20 statute miles). One such broadside carries explosives enough to demolish a block or more of city dwellings. Any vessel hit by it, other than a heavily armored battleship, would be reduced to a shattered wreck.

The heavy guns are fired from a central *fire-control station*, by means of an electromechanical *director*. This device permits a single officer to aim and

IMPORTANT PARTS OF A BATTLESHIP



The arrangement of armor in newer ships is kept secret, but the principles are illustrated here by the armor on the older battleship *New Mexico*. The dotted lines show where the armor is exceptionally heavy to protect vital parts from damage by the heaviest type of naval guns. Lighter armor protects other parts against all but the heaviest guns, and against airplanes.

fire the whole main battery or any part of it. The secondary battery and the anti-aircraft battery also have director control. All guns can be laid and fired by their crews, if the director system is put out of action.

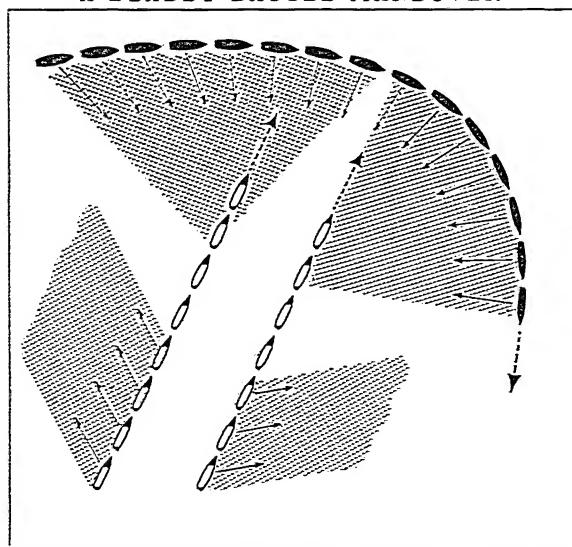
Range is at first determined by *range finders*. These are optical instruments which determine the distance to any visible object by a system based on triangulation (*see Surveying*); allowance is made for wind and the motion of the target. Meanwhile the ship has sent out one or more of the three airplanes it carries, with crews specially trained in fire-control duties. The ship fires a ranging shot or several shots.

The airplane observer notes the splash and reports by radio whether the shot is "over" or "short" of the target, and "right" or "left" of it. The director officer adjusts his fire accordingly and tries again, until the target is hit.

Protecting the Battleship by Armor

A battleship must also be able to receive terrific blows from an enemy, and still remain afloat and able to fight. Hence a great deal of its total weight is put into protection of various sorts. The most

A DEADLY BATTLE MANEUVER



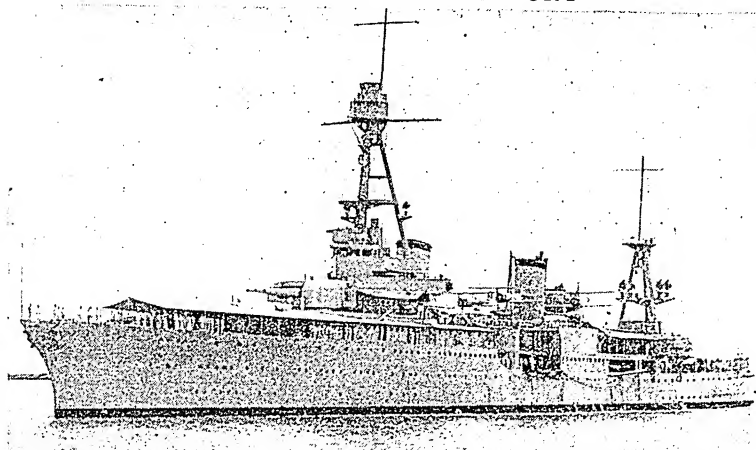
No commander would ask a better advantage than the Black Fleet has over the White one in the diagram. The Black Fleet has "encircled the head" of the White one, and every ship is within range, while only the leading White ships can fire back. So complete an advantage is rarely attained, but commanders maneuver to come as close to this situation as they can.

important protection is armor plate. A 33,000-ton ship, for example, may have 14,000 tons of armor, arranged to protect vital parts. Such a battleship has a "belt" of armor, from 14 inches to 16 inches thick, extending several feet above and below the water line for about two-thirds of the length on each side. The ends of this belt are connected by armored bulkheads, or partitions, running right across the ship. The top of the armored "box" thus made consists of two armored decks, one 3 inches thick and one 2½ inches thick. This "box," called the *citadel*, contains the engines and boilers, the principal auxiliary machinery, and the magazines for ammunition.

Four cylindrical towers of 16-inch armor rise from this citadel. Each tower bears on its top a revolving turret with two 16-inch guns. Through the towers ammunition is hoisted up to the guns from the magazines. The thickness of the turret armor varies from 18 inches on the turret face to 9 inches at the rear. Another tower, higher than the turrets, rises up to the bridge. This is the *conning tower*, where the captain and navigating personnel have their battle stations: Sixteen-inch armor protects this tower. A tube to the citadel contains the vital electrical connections to every part of the ship.

Armor plate consists of steel with 3.9 per cent nickel, 2 per cent chromium, and 0.35 per cent manganese. The face is "Harveyized" by heating with a coating of carbon, while the back is kept cool. The entire process, including shaping of the plate, takes about nine months. An odd relationship exists between the thickness of armor plate, the caliber of the largest shell it can stop, and the range of the shell in thousands of yards. A 16-inch plate should keep out a 16-inch shell when the range is not less than 16,000 yards.

A HEAVY CRUISER IN PORT



This view of a heavy cruiser shows the speedy lines of such craft, and its forward turret with 8-inch guns. Another turret is beneath the awning. Light cruisers are similar in appearance, but they carry 6-inch guns.

A 14-inch plate resists 14-inch shells at not less than 14,000 yards—and so on.

"Blisters" and Compartments

Armor is necessary for protection against the gunfire of enemy battleships, and against bombing by aircraft. But battleships must also withstand the explosion of torpedoes and mines against the unarmored bottom of the ship. For this purpose they have double bottoms, with a considerable air space between.

Further protection is given by "blisters," a sort of extra hull built outside the main hull. The "blisters," the double bottoms, and the interior of the ship are subdivided into many small compartments that can be shut off by water-tight doors. Thus the effect of underwater damage can be isolated, even though an explosion may blow a hole through all three of the ship's "skins."

Balancing Gun Power, Armor, and Speed

In addition to gun power and protection, the battleship must also have sufficient speed to enable it to fight and maneuver. It must have space for enough fuel to enable it to travel long distances without replenishment. Speed depends largely upon engine power. Before 1941 American battleships had maximum speeds of about 21 knots, or 24 statute miles an hour. Battleships placed in service in 1941 and thereafter can make from 28 to 30 knots. They can cruise at 10 or 12 knots between 10,000 and 15,000 miles.

Every ship is a compromise between the various qualities desired; this is especially true of a warship. Its weight must be divided among guns, armor, and other protection; engines and boilers; fuel and other needs. The most important balance is between armor and speed. In a battleship, speed is sacrificed in order to provide ample armor. The opposite policy is seen in the *battle cruiser*. Such ships have guns like those of a battleship, and considerably more speed, but much less armor. Speed and gun power make battle cruisers terrible foes for any smaller ship; but the lack of armor may be disastrous if

they encounter battleships. For example, in May 1941, the inadequately armored British battle cruiser *Hood* was instantly destroyed when it was hit in a magazine by only one shot from the German battleship *Bismarck*.

In general, American battleships are superior in protection, and equal if not superior in armament, to contemporary foreign ships, but the older ones are inferior in speed. Their boiler and engine power had been subordinated to armor and guns.

Fuel oil, storable in a small space and almost smokeless, is now used in all modern battleships. The United States has developed a system of propulsion called the electric or turbo-electric drive, in

which the engines run generators and the current is used in motors attached to the propellers. This gets increased energy from fuel, and hence American ships have 25-35 per cent more range than other warships.

4. Cruisers, Destroyers, and Other Lighter Naval Craft

CRUISERS are smaller and faster than battleships. When working with the fleet, they are used for scouting, holding off enemy scouts, protecting aircraft carriers, attacking the enemy's carriers, and supporting destroyer attacks. They also operate independently to attack enemy commerce, to protect friendly merchant vessels, and to aid in raiding or taking enemy bases.

The United States has three types of cruisers. The heaviest type, built after the outbreak of war, is of secret design. So-called "heavy" cruisers are ships of from 9,000 to 10,000 tons. They carry nine or ten 8-inch guns as a main battery and 5-inch antiaircraft guns. Their maximum speeds are from 32 to 35 knots. Light cruisers are ships of from 7,000 to 10,000 tons with maximum speeds of 33 knots and upward. They are called "light" because they carry 6-inch guns as a main battery. Each type has enough armor to stand up against other cruisers. The largest light cruisers can carry eight airplanes; but all cruisers carry at least three or four.

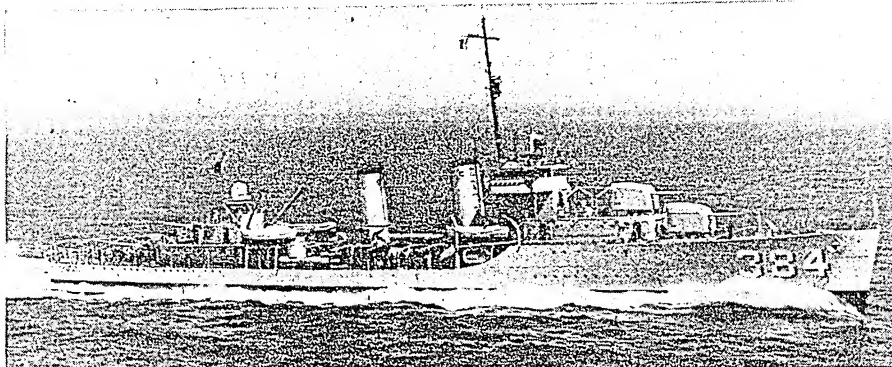
The United States has three types of cruisers. The heaviest type, built after the outbreak of war, is of secret design. So-called "heavy" cruisers are ships of from 9,000 to 10,000 tons. They carry nine or ten 8-inch guns as a main battery and 5-inch antiaircraft guns. Their maximum speeds are from 32 to 35 knots. Light cruisers are ships of from 7,000 to 10,000 tons with maximum speeds of 33 knots and upward. They are called "light" because they carry 6-inch guns as a main battery. Each type has enough armor to stand up against other cruisers. The largest light cruisers can carry eight airplanes; but all cruisers carry at least three or four.

Torpedo Boats, Destroyers, and Submarines

Battleships and cruisers carry guns as their principal armament. In contrast, the vessels called *flotilla craft* fight with the torpedo, the bomb, or the mine (see *Torpedoes and Mines*).

The first torpedo boats were designed to get within torpedo range of hostile warships by speed and stealth. To counter this method of fighting, very fast torpedo boats of somewhat larger size were designed, with an armament of light guns in addition to torpedo tubes. These ships, called *torpedo-boat destroyers*, gradually absorbed the duties of torpedo boats as a result of their superior seaworthiness.

A "GREYHOUND OF THE SEA"



Speediest of all ships are destroyers, such as the 1,500-ton *Dunlap* shown above. The guns are mounted high, to have nearly all-round fields of fire, while the torpedo tubes are on the deck nearer the water. Even this side-on view suggests the knife-like sharpness of the lines. This can be judged also by comparing the narrow bridge with the length of the vessel.

Destroyers are used today in large numbers in all the principal navies. Their duties are to deliver torpedo attacks on enemy ships, to aid in reconnaissance and screening duties, to lay down smoke screens, and to fight enemy destroyers and submarines.

The displacement of a modern American destroyer ranges from 1,500 to 2,100 tons, and its speed from 36½ to 41 knots. It carries 5-inch guns, for use against either surface craft or aircraft, 20-mm. anti-aircraft guns, and anti-aircraft machine guns. The torpedo armament includes twelve 21-inch tubes. The ship can steam 6,000 miles without refueling. Larger ships of this type are called "destroyer leaders" and serve as flagships for destroyer squadrons.

The old torpedo-boat type has reappeared in most navies in the form of fast little motor boats, often called *mosquito craft*. These are useful in coastal waters, but not on the high seas.

Submarines, like destroyers, rely on the torpedo for their main armament. The purpose of this craft is to approach unseen to within torpedo range of its target. This is hard to accomplish when the target is protected by destroyers. The submarine therefore has only limited value in fleet action. It is extremely dangerous, however, when it can take a "position in readiness" in a narrow waterway through which the enemy must pass. It is dangerous also to the ships of a blockading force, to damaged warships trying to make their way safely to port, and to merchant shipping. (See Submarine.)

Minor Fighting Vessels

There are a few other types of fighting craft. Escort vessels are chiefly for convoy duty. The larger ones, called *gunboats*, do all sorts of miscellaneous duty in time of peace, such as

protecting American interests in Latin America and China. Still smaller types, called *cutters* and *corvettes*, give aid in peacetime to merchant vessels in distress, and in time of war they help protect shipping against submarines.

Mine layers are vessels equipped to lay explosive mines in areas where an enemy may be expected. *Mine sweepers* are used to sweep up enemy mines with a

special "sweep," or by dragging a cable along the bottom. Navy mines are all "contact" mines which explode when struck by any vessel. Electrically operated mines for defending harbors are laid by the Coast Artillery Corps of the Army, using small vessels called *mine planters*.

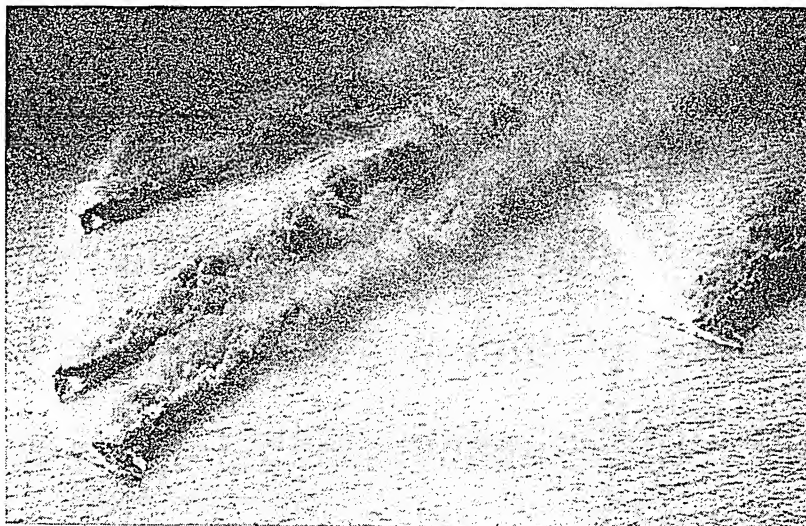
5. Naval Aviation and Its Functions

THE FIGHTING POWER of the Navy is rounded out by naval aviation. In the United States

Navy, airplanes are of two general types: ship-based and shore-based. The ship-based types are divided again into those carried on battleships and cruisers and those based upon special *carrier ships*.

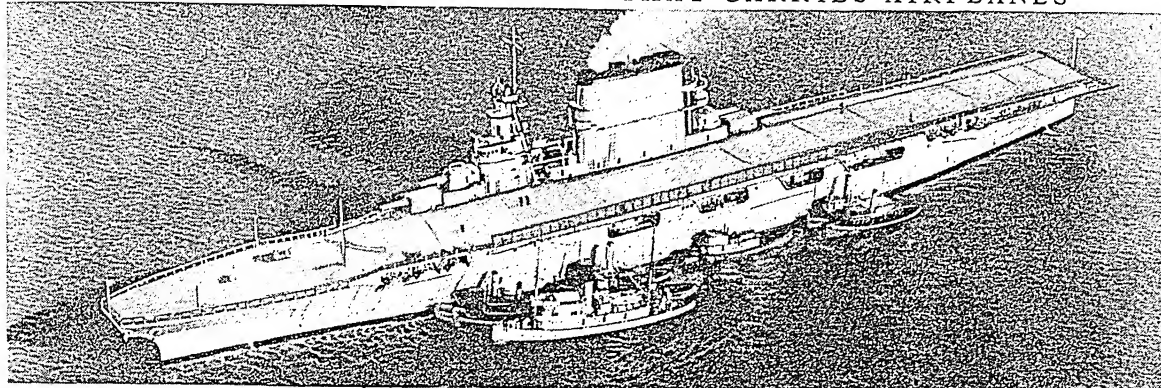
Battleships carry planes for "spotting" the fire of their guns, and cruisers carry planes for scouting. These are seaplanes, with floats which permit them to alight on the water. They are launched from the ship by catapults, and cranes hoist them aboard.

DESTROYERS SPREADING A SMOKE SCREEN



To make a smoke screen, the firemen change the draft under the boilers to prevent complete burning of the fuel. Dense smoke pours from the smokestacks, and the ships spread it at full speed. Within a few minutes, destroyers can hide an entire fleet from the enemy.

THE QUEER-LOOKING VESSEL THAT CARRIES AIRPLANES



The U.S.S. *Saratoga*, giant airplane carrier, is a floating aviation field and hangar. The funnels and turrets are on the starboard side, leaving nearly the whole sweep of the flight deck, 888 feet long, an unbroken flying surface. This deck can accommodate most of the ship's 50 airplanes and still leave room for taking off. Elevators carry the planes from the hangar deck below.

The aircraft carrier is a vessel with a long flat deck covering its whole upper surface. Planes which have ordinary wheeled landing-carriages can alight on this "flight deck" or take off from it. American carriers normally carry 80 planes—four squadrons of 18 planes each, and a "utility unit" of eight planes. Some carriers can accommodate as many as a hundred.

The carrier is highly vulnerable. Its size makes it a good target, and its flight deck is easily injured by shells or bombs. It must therefore always be guarded by cruisers and destroyers. Carriers must also be fast ships. In light winds they must attain high speed to enable their planes to take off with only the short run afforded by the deck. Furthermore, since they have to turn "into the wind" when planes are taking off or flying on, they must have speed to regain their battle stations rapidly.

Usually each carrier has one squadron of torpedo bombers, two squadrons of scout bombers, and one squadron of fighting planes, though these proportions can be varied. The torpedo bombers can carry either bomb loads or "aerial" torpedoes to be dropped when skimming close to the surface of the water. The scout bombers are smaller and are suitable also for reconnaissance duties. The fighters are used to shoot down enemy airplanes in flight, and sometimes to attack ships with machine-gun fire and light bombs.

Besides ship-based planes, the United States Navy operates planes from shore bases. These are the patrol bombers—big flying boats, with a boatlike hull, which can alight on the water. Their principal duty is distant reconnaissance, though they may also carry out bombing missions. To service patrol planes, ships

called *seaplane tenders* are used. The planes alight alongside and are hoisted aboard for repairs. The Navy also uses nonrigid airships, or *blimps*, and at times dirigibles, for observation and patrol.

The Problem of "Airplanes against Battleships"

When airplanes became able to carry heavy bombs over long distances, some airmen claimed that battleships were doomed. They said

that properly dropped airplane bombs or torpedoes could sink battleships. This view was strengthened in December 1941, when the American, British, and Japanese navies each lost one or more battleships from aerial attack. Against this stood the fact that battleships had withstood many earlier attacks. Also, in situations such as evenly balanced air power, in time of storm or in conflicts far at sea, the battleship could easily prove to be the decisive factor. Therefore the United States Navy believes in having each type of fighting power ready for use according to circumstances. This view recognizes that air power can make surface operations extremely hazardous, whenever and wherever airplanes can operate effectively.

But it recognizes also that weather and distance can all but nullify air power, and, when this happens, the surface fighting vessel is the key to victory.

HOW NAVY SHIPS ARE NAMED

BATTLESHIPS: states (*Washington*)
 CRUISERS: cities (*Houston*)
 AIRCRAFT CARRIERS: historic naval vessels or battles (*Ranger*, *Saratoga*)
 DESTROYERS: navy men, congressmen, inventors (*Dunlap*)
 SUBMARINES: sea animals (*Shark*)
 GUNBOATS: small cities (*Erie*)
 RIVER GUNBOATS: islands (*Mindanao*)
 MINE SWEEPERS: birds (*Osprey*)
 SUBMARINE TENDERS: submarine pioneers (*Fulton*)
 REPAIR SHIPS: mythological characters (*Jupiter*)
 OILERS: rivers (*Platte*)
 CARGO SHIPS: stars (*Sirius*)
 DESTROYER TENDERS: natural areas of the United States (*Prairie*)
 LARGE SEAPLANE TENDERS: sounds (*Albemarle*)
 SMALL SEAPLANE TENDERS: bays, straits, inlets (*Barneget*)
 TUGS: Indian tribes and chiefs (*Seminole*, *Osceola*)
 MINE LAYERS: words of menace (*Terror*)

6. Service Vessels and the Shore Establishment

THE SERVICE SHIPS, called as a class "auxiliary ships," are of various types. Besides seaplane tenders, the Navy has destroyer tenders and submarine tenders, which carry supplies and equipment for repairing these small vessels. Repair ships are floating machine shops for making major re-

pairs to battleships, cruisers, and aircraft carriers. The purpose of ammunition ships, oilers, store ships, hospital ships, cargo ships, surveying ships, and fleet tugs is indicated by their names. Transports carry personnel from point to point.

Navy yards are maintained at Portsmouth (N.H.), Boston, Brooklyn, Philadelphia, Washington (D.C.), Portsmouth (Va.), Charleston (S.C.), Mare Island (Calif.), Bremerton (Wash.), Pearl Harbor (T.H.), and Cavite (P.I.). In addition to these, the Navy has manufacturing establishments at other places. Guns and their mounts are made in the gun factory at the Washington Navy Yard. Powder is made at Indianhead, Md. There is a proving ground for guns at Dahlgren, Va., on the Potomac. The torpedo station at Newport, R.I., makes torpedoes. Other torpedo stations are at Keyport, Wash., and Alexandria, Va. A mine depot is situated at Yorktown, Va. Other manufacturing establishments are at Baldwin, on Long Island, and at South Charleston, W. Va.

Aviation is served by an airplane factory in Philadelphia, a dirigible base at Lakehurst, N. J., and 27 operating bases in the United States and on islands in the Atlantic, the Caribbean, and the Pacific. The largest bases are at Quonset Point, near Newport, R. I.; Norfolk, Va.; Coco Solo, Canal Zone; San Diego, Calif.; Seattle, Wash.; and on the island of Oahu, in Hawaii. Training bases are maintained at Pensacola, Miami, and Jacksonville, Fla.; and at Corpus Christi, Tex. Recruit seamen are trained at Newport, R. I.; Norfolk, Va.; Great Lakes, Ill.; and San Diego, Calif. Radio beacon and direction-finding stations dot the coasts. Hydrographic Offices are located all over the United States, in Puerto Rico, and Hawaii.

Other establishments include naval hospitals, experimental and research establishments, the Naval Observatory at Washington, and the Naval Academy at Annapolis, Md. The Naval War College at Newport, R. I., offers courses for selected higher officers. The Postgraduate School at Annapolis gives courses to younger officers who have served about seven years

after graduation from the Academy. The Navy also maintains establishments for the Marine Corps.

The supreme control of the Navy is vested in the president as Commander in Chief. The president exercises his authority through his appointed officer, the secretary of the navy. The secretary controls the Navy through the Commander in Chief of the United States Fleet and the Chief of Naval Operations, and through the Navy Department (*see* United States Government). Shore affairs are administered by the commandants of 15 naval districts. The district headquarters are located at Boston, New York, Philadelphia, Norfolk, Charleston, Key West, New Orleans, Great Lakes, San Diego, San Francisco, Seattle, Pearl Harbor (Hawaii), the Panama Canal Zone, San Juan (Puerto Rico), and Cavite (Philippine Islands).

7. Personnel of the Navy

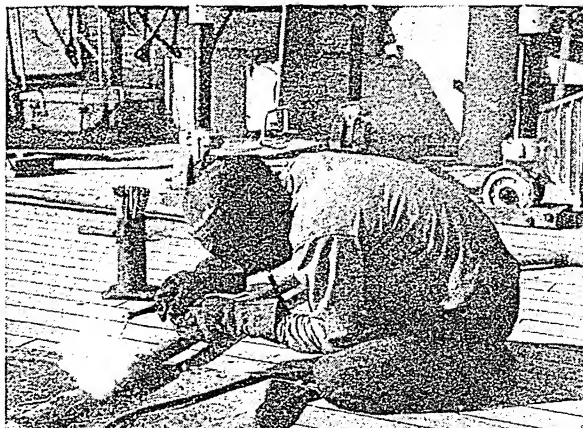
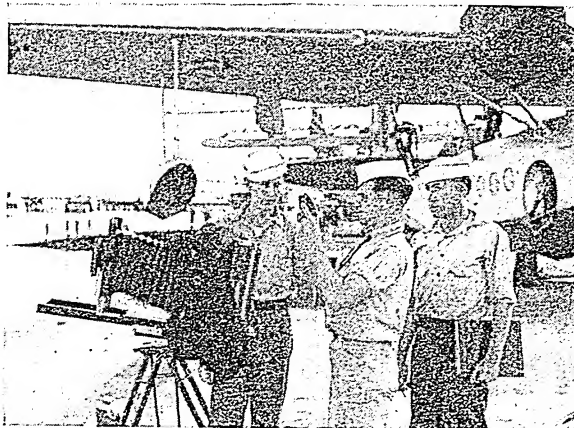
BEHIND SHIPS and bases is the human factor, upon which efficient operation must always rest. The officers and men of the fighting force constitute the "line" of the Navy. The various Staff Corps include the Medical, Dental, Supply, Civil Engineer, Construction, and Chaplains' Corps.

Appointments to the Medical and Dental Corps are made from civil life, after examination and a course of instruction. Appointments to the Civil Engineer Corps and the Construction Corps are mostly by transfer from the line. Appointments to the Supply Corps are from graduates of the Naval Academy or from specially selected graduates of Naval Reserve Officers' Training Corps at certain universities and colleges. Chaplains are appointed from civil life.

Commissioned Officers

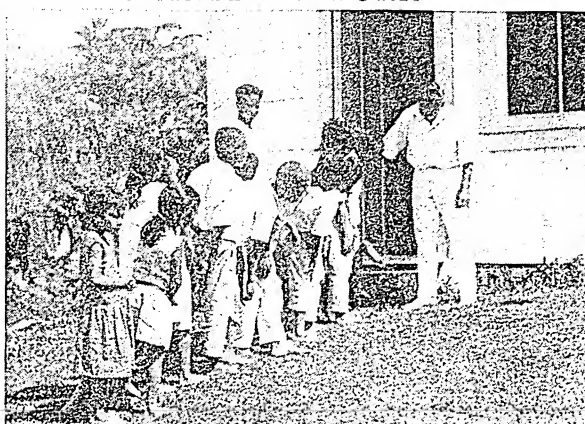
Commissioned officers of the line begin their career as ensigns after graduation from the Naval Academy (*see* Naval Academy, United States). They may apply for retirement after serving 40 years, and the president has discretion to accept application for retirement after 30 years. All officers below the rank of vice admiral must retire when they reach the age

TWO NAVY OCCUPATIONS WHICH CAN BE FOLLOWED IN CIVIL LIFE



Naval service includes training in many occupations which men can follow if they leave the service. At the left, sailors are receiving training in photography as a start toward becoming aerial photographers. At the right is a Navy welder.

SAILORS AND A PHARMACIST'S MATE AT WORK



At the left, two sailors are lashing one of the hammocks in which sailors sleep, for stowage during the day. At the right, a pharmacist's mate in the island of Guam is receiving native children who need first aid for minor injuries.

of 64. Both classes of retired officers receive up to 75 per cent of their last base pay.

Three years of acceptable service as an ensign brings promotion to lieutenant, junior grade. Thereafter officers are considered for promotion after four years' service in a grade. This system of promotion was started in 1916, to promote the best-qualified officers rapidly, while keeping the corps in substantially the following proportions by ranks:

Rank	Percentage	Rank	Percentage
Rear admiral	1	Lieutenant commander	15
Captain	4	Lieutenant	30
Commander	8	Lieutenant (junior grade) and ensign	42

Every year, selection boards consider the records and qualifications of officers who are eligible for promotion. Those judged to be best qualified are promoted until all vacancies are filled. The others are retired with $2\frac{1}{2}$ per cent of their base pay for each year they have served. Their places are filled by promotion from the next lower rank. This system is hard on many good officers who may have served many years, but the Navy believes that it insures a constant flow upward of the best younger officers. It also brings the best men to the top while still in the prime of life, instead of making them wait until all officers ahead of them have retired.

Ranks and Commands of Officers

The ranks of admiral and vice admiral are temporary in time of peace. Such officers are rear admirals who hold the higher rank while they exercise some particular high command. The Chief of Naval Operations, the Commander in Chief of the United States Fleet, the Commander in Chief of the Asiatic Fleet, and the Commander of the Battle Force are admirals. Vice admirals include the Commander, Scouting Force; the Commander, Aircraft, Battle Force; and the Commander, Battleships, Battle Force.

Naval ranks and their appropriate commands are given in the table in the next column. A captain in charge of a battleship has a commander as executive

officer, and five commanders or lieutenant commanders as "heads of departments." These act as navigator, engineer officer, gunnery officer, first lieutenant and damage control officer, and communications officer. The ship's company is grouped into "divisions," each under a lieutenant with one or more ensigns to assist. In naval aviation, patrol wings are usually commanded by captains or commanders; squadrons, by lieutenant commanders.

NAVY RANKS AND APPROPRIATE COMMANDS

ADMIRAL. The principal fleet or separate fleets.

VICE ADMIRAL. Major division of the fleet.

REAR ADMIRAL. A division of capital ships, a flotilla of lesser ships, or a naval district.

COMMODORE. A small force that warrants a "flag" officer but not an admiral.

CAPTAIN. A capital ship, a squadron of destroyers, or a naval station.

COMMANDER. A small cruiser, gunboat, auxiliary ship, or a division of destroyers or submarines.

LIEUTENANT COMMANDER } A destroyer, a submarine, or
LIEUTENANT } a small auxiliary.

OFFICERS WHO DO NOT ORDINARILY COMMAND VESSELS

LIEUTENANT (junior grade) MIDSHIPMAN

ENSIGN AVIATION CADET

COMMISSIONED WARRANT OFFICER WARRANT OFFICER

An admiral ranks with a general of the Army, and below these officers the commissioned ranks match down to the Navy ensign and Army second lieutenant.

Warrant Officers and Enlisted Men

In addition to the commissioned officers, who hold their commissions from the president, there is a class of warrant officers, who are specialists promoted from enlisted men. These are boatswains, gunners, machinists, electricians, radio electricians, carpenters, pharmacists, and pay clerks. They are selected by competitive examination from chief petty officers and first-class petty officers. After serving six years as warrant officers, they are commissioned chief boatswain, chief gunner, etc., taking rank with, but after, ensigns. They may eventually receive

the pay and allowances of a lieutenant commander.

Enlisted men must be intelligent American citizens of good character. For first enlistment, recruits must be from 17 to 31 years old and unmarried; enlistment is for six years. In emergencies, men may enlist in the reserve for four years or the duration of the emergency. Minors must have consent of parents or guardian. Those who are 17 years old may enlist until they are 21. Recruits go first to a naval training station, and then become second class seamen, or third class firemen. They may become chief petty officers by successive appointments after examination; qualified men may become officers.

Men who want a specialty may be trained as electricians, radiomen, photographers, motion-picture technicians, ordnancemen, machinists, metalworkers, woodworkers, deep-sea divers, cooks, musicians,

BAKING NAVY PIES



The navy trains thousands of expert bakers and cooks to feed its hungry sailors economically but well.

clerks, and various other specialists. Aviation training is also open to selected candidates.

Pay begins at \$50 a month for apprentice seamen, and rises to \$138 (base pay, not including allowances for length of service) for chief petty officers on permanent appointment. Each man receives an initial clothing allowance, and free food, quarters, medical attendance, and other services. He may retire on three-quarters' pay after 30 years' service. Married men are allotted quarters and given medical attention for their families, if these facilities are available where the men are stationed. Cash allowances may be made when quarters are not available. After 16

or 20 years' service, an enlisted man may transfer to the Fleet Naval Reserve with "retainer pay" according to the length of active service. (For naval insignia and uniforms, *see* Uniforms.)

The History of Navies and Sea Fighting

THE FIRST warship was the galley, used by Egyptians, Phoenicians, and Greeks. Galleys were small vessels propelled by one or more banks of oars, with auxiliary sail power (for picture, *see* Ships). They fought in two ways—by ramming an enemy ship with the metal beaks on their prows or by grappling it so that troops could fight man to man. The Carthaginians and the Romans developed naval artillery—machines to throw stones and darts and other hurling devices. These primitive fighting methods decided the important ancient naval battles of Salamis (480 B.C.), which prevented Persian power from spreading into Europe, and of Actium (31 B.C.), which made Octavian the first Roman emperor.

Rowing galleys continued in use throughout the Middle Ages, and figured in the most important sea victory of the period—the destruction of Genoese sea power by the Venetians at Chioggia in 1380. Although the sailing ship and the use of gunpowder were developing even then, the old tactics persisted and were used in 1571, when the fleets of Spain, Venice, and the Papacy defeated the Turks at Lepanto. Sail and cannon proved their superiority, however, 17 years later when the English defeated the Spanish Armada. The Spanish force was commanded by soldiers who tried to catch the English vessels for hand-to-hand fighting in the ancient fashion; but they could do nothing against the English tactics of remaining at a distance and fighting with cannon (*see* Armada, Spanish).

Sailing ships armed with cannon reached their highest development in the days of Nelson, Rodney, and the other great admirals who commanded in the English-French naval wars between 1775 and 1815. The capital ship of that day was the "line-of-battle

ship," or ship-of-the-line, carrying from 64 to 120 guns. The frigate, with from 36 to 50 guns, was the cruiser of the period. Smaller ships included corvettes, sloops of war, and gunboats.

The ships of this period fought chiefly with their artillery, though at close quarters musketry and hand grenades were used. Boarding was frequent, especially as the culminating phase of actions between two frigates or smaller vessels. Battles between sailing fleets culminated in Nelson's victory over the French and the Spanish fleets near the Strait of Gibraltar at Cape Trafalgar Oct. 21, 1805. After this victory, no nation challenged the power of the British main fleet for more than a century.

Beginnings of the American Navy

American naval history began during this period. During the American Revolution, the colonists sent out privateers, which inflicted serious damage upon British shipping. On Oct. 13, 1775, the Continental Congress appointed Silas Deane, John Adams, and John Langdon as a committee to fit out two warships. During the struggle more than a dozen vessels were commissioned as naval vessels. These craft won many a battle under commanders such as John Paul Jones, John Barry, and Esek Hopkins.

Hopkins was commissioned Commander in Chief of the Fleet on Dec. 22, 1775, and led the first American fleet to sea on Feb. 17, 1776. In all, the Americans captured or sunk 202 British war vessels, and captured some 800 naval and merchant vessels. The most notable sea fight of the war was the victory of the *Bonhomme Richard* over the *Serapis* on Sept. 23, 1779. The decisive naval event, however, was the victory of the French fleet under De Grasse over the British

under Admiral Graves off Chesapeake Bay on Sept. 5, 1781. This victory was an important factor in forcing Cornwallis to surrender at Yorktown, since it cut off hope of relief or escape by sea. (See also Barry, John; Jones, John Paul).

The Revolutionary navy was disbanded after the war. No United States naval force existed until the attacks of Barbary pirates on American commerce prompted Congress to pass an act on Mar. 27, 1794, authorizing the construction of six frigates. These were later named *Constitution*, *President*, *United States*, *Chesapeake*, *Constellation*, and *Congress*. The Navy Department was founded with the appointment of Benjamin Stoddert as the first secretary, on Apr. 30, 1798.

Exploits of New Navy

The new ships, with good commanders and crews, performed excellently in a short naval war with France in 1799 and 1800 (see Adams, John). In 1803 and 1804 they compelled the Barbary States of North Africa to respect American ships. Among the notable commanders of this period were Capt. Thomas Truxtun (1755-1822), victor in two hard-fought combats with French frigates; Captains Edward Preble (1761-1807), Richard Dale (1756-1826), John Rodgers (1773-1838), and William Bainbridge (1774-1833), leaders in the fight against Tripoli; and Lieut. Stephen Decatur (see Decatur, Stephen).

In the War of 1812, the United States had no ships of the line which could be used against the British main fleet; but American frigates and crews proved vastly superior in fights between single ships. The designer of the frigates, Joshua Humphreys (1751-1838), had given them heavier guns and thicker sides

than any British frigate; and yet they were equal to the British craft in speed and maneuverability. The crews, instead of blazing away without aim as the

British all too often did, aimed each shot at the enemy's water line. Most fights between frigates therefore soon reduced the British ship to a sinking wreck, while the American ship came off with but little damage and loss of life.

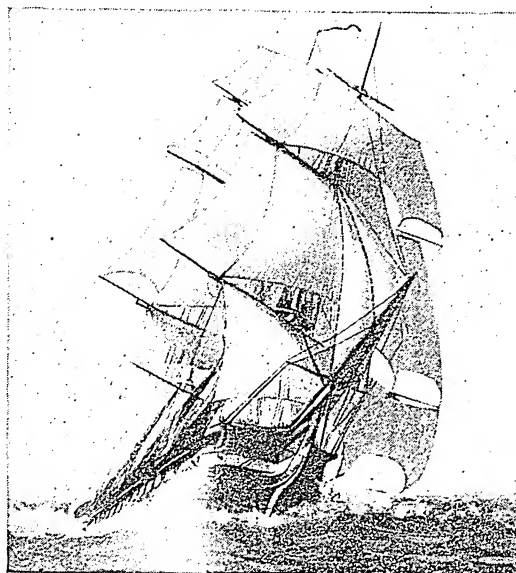
Perry's victory on Lake Erie saved the Northwest Territory. Macdonough's victory on Lake Champlain prevented the invasion of New York and greatly influenced the terms of peace. (See Perry, Oliver Hazard; War of 1812.)

Transformation of Navies by Steam and Iron

The age of steam brought great changes to the world's navies. These changes were just beginning to take form at the outset of the Civil War. One development was the steam-driven, ironclad monitor with one or more turrets (see Monitor and Merrimac). The naval activity of the war consisted largely of a naval blockade of the Confederate coast, punctuated by spectacular exploits of Confederate blockade runners and by naval attacks on Southern ports (see Blockade; Civil War; Farragut, David Glasgow; Porter, David Dixon). Armored river boats also played an important part in actions along the Mississippi, Cumberland, and Tennessee rivers.

After the Civil War, the United States Navy

fell into decay. Other sea powers, taking to heart the lessons of the ironclad monitor type, began building powerful steel ships with turrets and breech-loading rifled guns. Thus the forerunners of the modern battleship appeared. In 1883, under President Arthur, the United States began to build a modern navy. This



"OLD IRONSIDES"

The 44-gun frigate, the *Constitution*, is the most famous ship in American history. She was launched Oct. 21, 1797. As Commodore Edward Preble's flagship she helped to bombard Tripoli in 1804. Under Capt. Isaac Hull, early in the War of 1812, she destroyed the British frigate *Guerrière*. This encounter brought her the name *Old Ironsides*, for when a shot fell harmlessly off her side a sailor cried out, "Huzza! Her sides are made of iron!" Four months later, under Capt. William Bainbridge, the *Constitution* captured the British frigate *Java* off Brazil. After capturing several other prizes, in 1815 she took the *Cyane* and the *Levant* in a single battle.

Condemned as unseaworthy in 1830, the old ship was saved by Oliver Wendell Holmes's famous poem which begins as follows:

Ay, tear her tattered ensign down!
Long has it waved on high,
And many an eye has danced to see
That banner in the sky;
Beneath it rung the battle shout,
And burst the cannon's roar;—
The meteor of the ocean air
Shall sweep the clouds no more.

She was rebuilt and served well for another 48 years, making her last transatlantic trip in 1878. Since 1897 the *Constitution* has usually lain in Boston Navy Yard. Threatened with dry rot and decay, the venerable vessel was rebuilt by public contributions between 1925 and 1931. Not more than 15 per cent of the original materials remain. Under her own sail, from 1931 to 1934, she made a 22,000-mile journey to the Atlantic and Pacific ports of the nation.

force proved strong enough to win the Spanish-American War of 1898.

Immediately after the war, President Theodore Roosevelt laid the foundation of the present sea power of the United States by insisting upon the construction of a powerful battle fleet. Much of the impetus for building this navy came from two books by Capt. (later Rear Admiral) Alfred Thayer Mahan (1840-1914) of the United States Navy, who argued that sea power is the basis of success in war and prosperity in peace for all great industrial nations. (See Roosevelt, Theodore.)

The "Dreadnought" Begins a New Era

In 1905 the British, inspired by Admiral Lord Fisher, launched the epoch-making battleship *Dreadnought*. Hitherto battleships had been armed with four heavy guns in two turrets, one forward and one aft, and a powerful secondary battery of smaller guns. The *Dreadnought*, with ten 12-inch guns in five turrets, made every existing battleship obsolete. This compelled the rebuilding of every navy in the world. Germany especially started a huge shipbuilding program which was one of the factors contributing to the outbreak of the World War of 1914-1918. (For the naval events of this war and the destruction of German naval power, see World War of 1914-1918.)

Attempts to Limit Naval Armaments

Hoping to prevent ruinous competition in naval building after the war, President Harding called the Washington Conference of 1921-22. The chief result of this was a five-power treaty which established for 15 years a 5-5-3 ratio for capital ships between the United States, Great Britain, and Japan with a 1.67 proportion for France and Italy. No limit was placed on other types of vessels, save for the provision that none should be built larger than 10,000 tons or carry guns larger than 8-inch caliber. President Coolidge sought to obtain further reductions by Great Britain and Japan at a conference at Geneva in 1927, but the effort failed. However, limitations of smaller craft were accepted by the United States, Great Britain, and Japan at the 1930 London Conference.

These treaties gave each of the three leading powers sufficient strength for defense, but not for attack. Japan received a lower ratio on the ground that distance would prevent the American or British fleets from attacking Japan. All powers agreed also not to strengthen navy yards or fortifications within striking distance of Japan.

When international relations became strained because of Japanese policies in Manchuria and China, Japan announced that it would not renew the treaties after their expiration on Dec. 31, 1936. This refusal started a new naval race. A treaty signed by France, the United States, and Great Britain in 1936 and supplementary pacts between Great Britain, Germany, and Russia in 1937 set no quantitative limits, except for Germany. "Escape" clauses enabled each power to modify treaty restrictions. All, except Russia, were obliged to exchange building plans. Germany re-

nounced its agreement with Great Britain in 1939, and after the outbreak of war with Germany in the same year Great Britain suspended the treaty indefinitely.

In 1940 the international situation led Congress to authorize construction of a "two-ocean" navy, to be completed by 1946 and strong enough to defeat any possible combination of enemies. The plan called for about 700 vessels totaling more than three million tons, with a central force of perhaps 35 battleships, 20 airplane carriers, and 15,000 airplanes.

Navies of the World

When war broke out in 1939, the only navy equal in tonnage and ships to that of the United States was the British. It was not equal, however, in effectiveness, because normally it had to maintain strong detachments in the Orient, the Mediterranean, and the West Indies to defend possessions and trade routes.

The next strongest navy was the Japanese, with about seven-tenths the fighting strength of the United States fleet. It was stronger, however, than any force which could be sent into its home waters. Next came the French and Italian navies, each strong in new ships of the lighter types. The German navy was small, but modern and efficient. It specialized in submarines and *pocket battleships*—10,000-ton vessels with high speed and heavy guns. The Netherlands possessed cruisers, destroyers, and submarines, with good aviation, for defense of colonial possessions. Little was known about the navy of Soviet Russia, but it was thought to be strong in submarines.

Until Japan and the United States entered the war, the struggle at sea had consisted largely of British efforts to maintain a blockade, and German and Italian efforts to weaken the British navy and sink merchant shipping. Air power had been used largely in land warfare. But Japan and the United States unleashed powerful air attacks against enemy vessels with torpedo planes, high-level bombers, and dive bombers. The success of these attacks brought the airplane to the front as a decisive naval weapon. (See World War, Second; and see also Navy in the FACT-INDEX at the end of this volume.)

Books about the Navy and Naval Warfare

- Baldwin, H. W. What the Citizen Should Know About the Navy (Norton, 1941).
 Brodie, Bernard. A Layman's Guide to Naval Strategy (Princeton Univ. Press, 1942).
 Brodie, Bernard. Sea Power in the Machine Age (Princeton Univ. Press, 1941).
 Davis, C. T. A Navy Second to None (Harcourt, 1940).
 Knox, D. W. A History of the United States Navy (Putnam, 1936).
 Lovette, L. P. Naval Customs, Traditions and Usage (U. S. Naval Institute, 1939).
 McMurtrie, F. E., ed. Jane's Fighting Ships (Macmillan, 1942).
 Mahan, A. T. The Influence of Sea Power upon History, 1660-1783 (Little, 1897).
 Metcalf, C. H. A History of the United States Marine Corps (Putnam, 1939).
 Powell, Hickman. What the Citizen Should Know about the Coast Guard (Norton, 1941).
 Puleston, W. D. Annapolis (Appleton-Century, 1942).
 Rimington, Critchell. Fighting Fleets (Dodd, 1943).
 Sprout, H. H. and M. T. Rise of American Naval Power, 1776-1918 (Princeton Univ. Press, 1939).
 Sprout, H. H. and M. T. Toward a New Order of Sea Power, 1918-1922 (Princeton Univ. Press, 1940).
 Winston, R. A. Aircraft Carrier (Harper, 1942).

The FERTILE PRAIRIES of the "CORNHUSKER STATE"

NEBRASKA. Well-tilled acres of corn and wheat and green pastures covering the gently sloping plains, tidy farmhouses and groups of planted trees, giving evidence of plenty and comfort attained through well-directed industry and thrift—this is a typical scene in Nebraska, one of the nation's great larders, producing vast supplies of bread-stuffs and beef.

Some parts of Nebraska, it is true, present quite a different aspect, for in its 77,237 square miles (larger than all New England) there is room for many varieties of scenery. On the banks of the Missouri River at the eastern border steep bluffs show their varied outlines against the clear blue of the sky. The Niobrara River in the north flows for part of its course through rugged and picturesque canyons, clothed with pines and cedars and abounding in innumerable springs. Near the western border are hills that rise almost to the dignity of mountains. In the extreme northwest corner extends a small section of the "bad lands" of South Dakota—fantastic hills and terraces rich in fossil remains of prehistoric ages. East of the foothills and bad lands are table-lands, and east

Extent.—North to south, about 208 miles; east to west, about 465 miles. Area, 77,237 square miles, of which 584 square miles are water. Population (1940 census), 1,315,834.

Natural Features.—Gently rolling prairies in east rising toward the west; elevated plains and foothills of Rocky Mountains (highest point, about 5,300 feet) in west; "bad lands" in northwest corner. Principal rivers: Missouri and its tributaries, the Niobrara, Platte, and Republican. Mean annual temperature, 49°; mean annual precipitation, 23".

Products.—Corn, wheat, hay, oats, barley, sugar beets, rye, sorghum, potatoes; hogs, cattle, poultry and eggs, sheep, horses; meat packing, flour and mill products, dairy products, sugar refining.

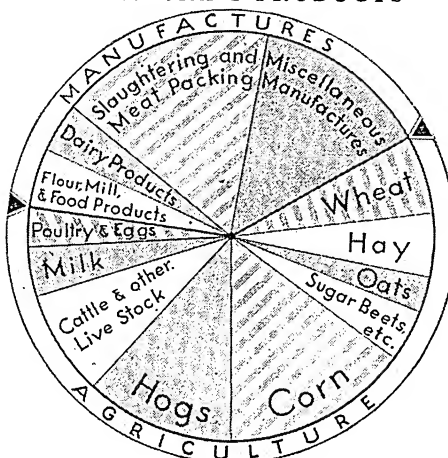
Cities.—Omaha (223,844), Lincoln (capital, 81,984); Grand Island, Hastings, North Platte, Scottsbluff, Fremont, Beatrice, Norfolk.

though these once shifting dunes have become stable with the cessation of prairie fires and the advance of settlement, "blowouts" scooped in their sides by the

wind are still characteristic landmarks. Toward the east these hills become rolling prairies, including three-fourths of the area of the state.

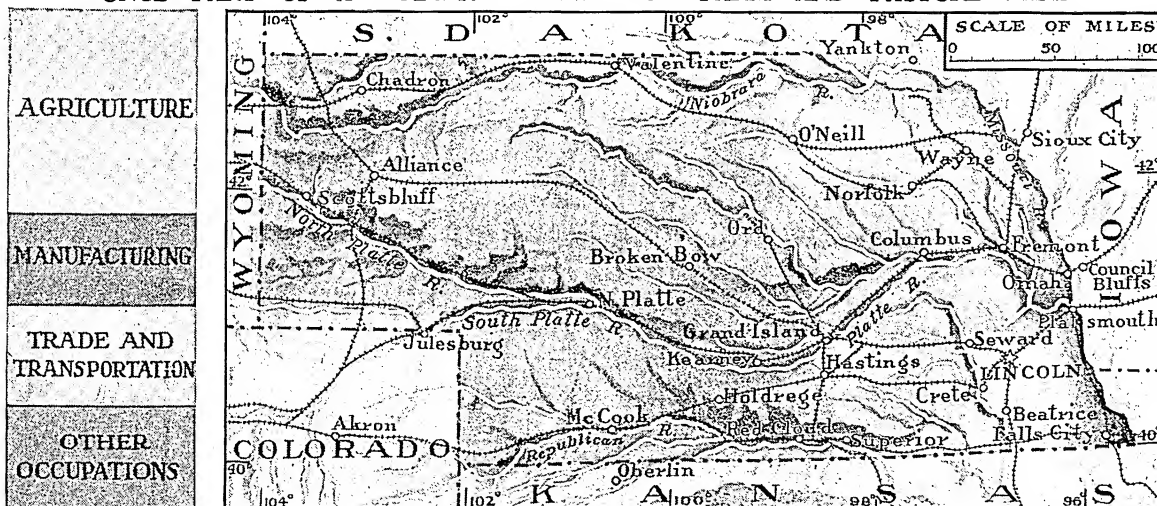
Early explorers called the Nebraska region the "Great Desert," for in the extreme western part the rainfall is too scanty to support crops, and, before it was broken by the plow, the densely matted sod of the eastward-sloping prairie drained most of the water off into the rivers. But since Nebraska farmers have learned to tap the inexhaustible treasures of underground water which underlies nearly all the state, there is practically no part which cannot be successfully cultivated. Plowing and irrigation are said to have raised the level of the underground water-table in many places. In the eastern part of the state, since

NEBRASKA'S PRODUCTS



Of the total value of Nebraska's products, more than six-sevenths comes from its farms and grazing lands.

ONCE PART OF A "DESERT"—NOW RICH FARM AND PASTURE LAND

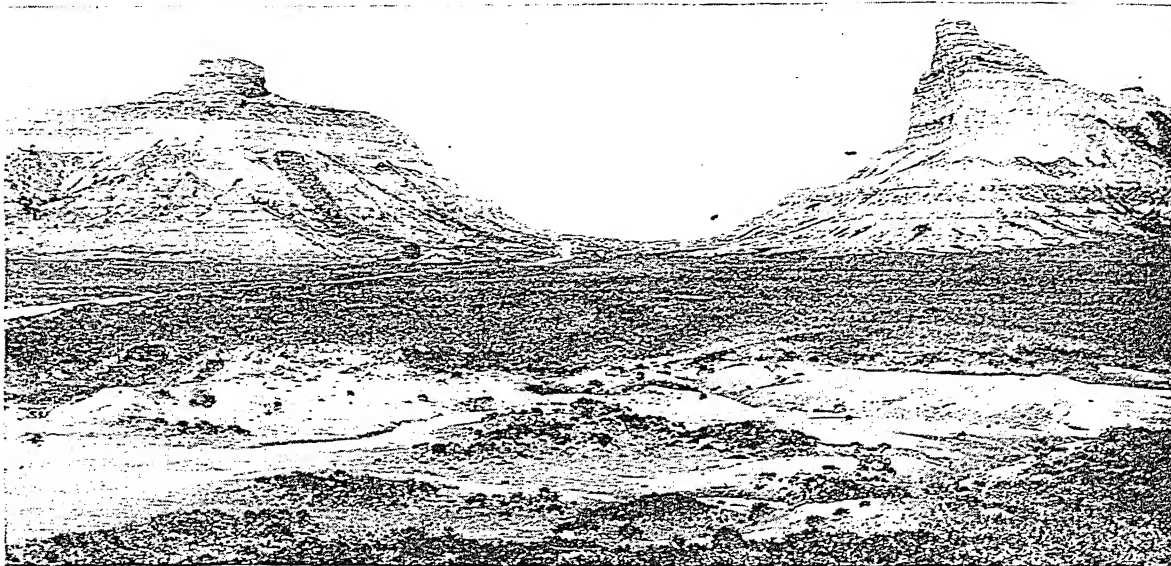


Before they knew how to farm such land, early residents thought that large parts of Nebraska were a barren waste. Now, however, practically every part of it produces abundantly. Farming is concentrated in the eastern part, while the vast sandy ranges of the upper northwest portion are unexcelled as grazing land for cattle. The divided bar at the left of the map shows the relative numbers of people engaged in various occupations. Farming is, of course, far in the lead.

nearly half the annual rainfall comes in the three growing months, May, June, and July, it is sufficient for crop needs. In the western third, especially in the Platte and Republican valleys, irrigation is extensively practiced. In the valley of the North Platte, canals constructed by the United States distribute water from the immense Pathfinder reservoir, which holds about 1,000,000 acre-feet of water drawn from melting Colorado and Wyoming snows. Dry farming

Though Nebraska is primarily an agricultural state, manufacturing industries are steadily growing, particularly those based on agriculture. It ranks high in the production of creamery butter, and the meat-packing plants of South Omaha are among the largest in the United States. It has several beet-sugar factories and hundreds of flour mills. Lack of coal and other minerals has hindered the development of manufactures. Nebraska has been called the "state

A NATURAL GATEWAY ON THE OLD OREGON TRAIL



Through historic Mitchell Pass in western Nebraska rolled the prairie schooners which carried the pioneers out to the winning of the west. In Nebraska this famous highway was variously known as the California, Mormon, Salt Lake, or Oregon Trail. Later the name "Oregon Trail" has been permanently attached to this famous old route. The picture also illustrates the process of erosion by which the hills of Nebraska have been washed down to deposit valuable fertile soil in the valleys.

methods have produced phenomenal yields in the same region on land which cannot be irrigated.

Its many varieties of rich soil and especially the deep, mellow, moisture-retaining subsoil, now that farmers have learned how to treat them, make Nebraska one of the greatest agricultural states of the Union. It is usually among the leading states in the production of corn, and stands high for oats, wheat, prairie hay, and alfalfa. There are more than a hundred native grasses, some of great value, which help to feed great herds of cattle. The live stock industry is of great importance, the sandhill region producing a high quality of range beef, while on the farms to the east great numbers of cattle and hogs, home-grown or imported from other states, are fattened for the market on Nebraska corn. Sugar beets, raised under contracts with the factories, are an important crop in the river valleys. Potatoes constitute another important crop, much of which comes from the irrigated lands. Much of the American boy's popcorn comes from central and northeastern Nebraska. The orchard industry is of increasing importance in the southeastern part of the state. Apples are most generally raised; peaches, cherries, nectarines, and small fruits are also grown.

without a mine" and mineral products in general are of little importance. Yet the state has mineral resources in the great quantities of alkaline deposits to be found particularly in the sandhill section. When imports of potash from Germany were cut off during the World War, this was one of the chief sources of the American supply. The beet-sugar wastes were also treated to recover their potash content. One sugar factory produced nearly 1,500 tons of potash the first year. Building stone and clay products, pumice, and gravel are important industrial items. Volcanic ash, particularly from the Republican valley, is used by packing-house companies in making scouring soap and cleansing powders.

The climate of Nebraska is exceptionally healthful. Though extremes of temperature are reached, both heat and cold are less severely felt because of the dry atmosphere. The "scenery of the sky," especially the splendor of a Nebraska sunset seen across the rolling prairie, compensates for the lack of grandeur which mountains, lakes, and forests lend other states.

Generally known as the "Cornhusker State," Nebraska is officially called the "Tree Planters' State." The first settlers found a prairie almost entirely without trees except along the streams and

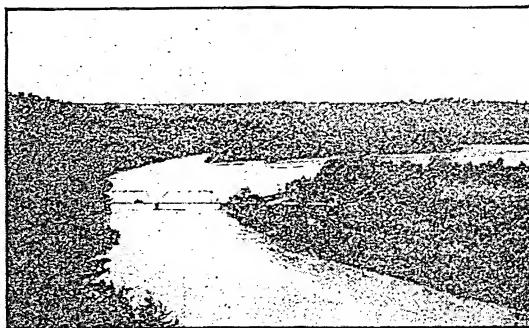
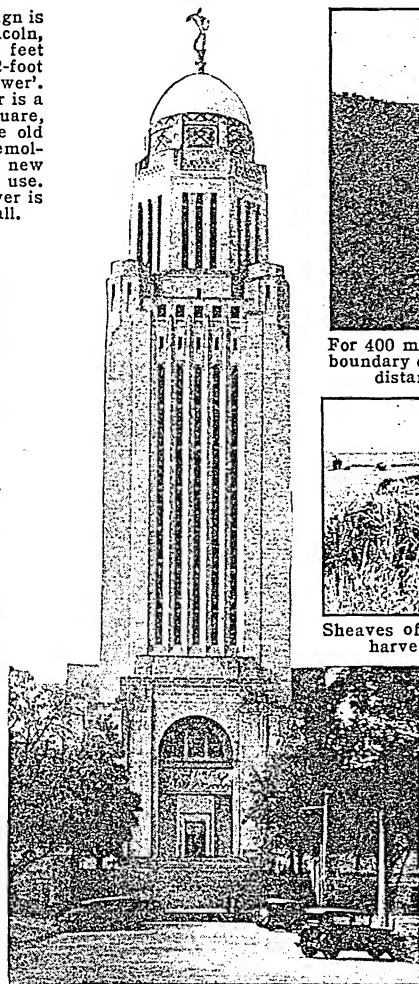
GLIMPSES OF NEBRASKA'S WEALTH AND PROGRESS

Striking and original in design is the new state capitol at Lincoln, with its central tower 368 feet high, surmounted by a 32-foot bronze statue of 'The Sower'. About the base of the tower is a two-story building 434 feet square, which was built around the old capitol. The latter was demolished when part of the new structure was ready to use. Below the dome on the tower is an octagonal memorial hall.



Much of Nebraska's wealth comes from the tall corn, which leads among farm crops.

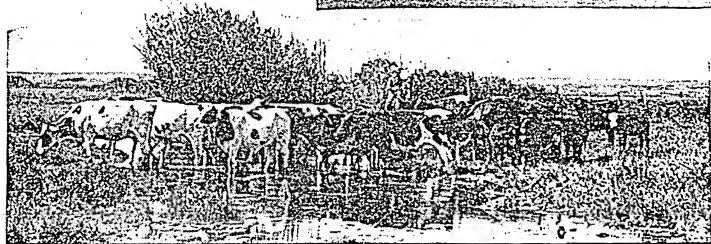
The Holstein dairy herd, below, represents another important source of income to Nebraska.



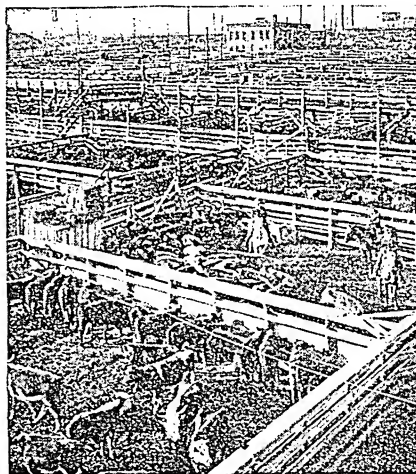
For 400 miles the Niobrara River rushes along the northern boundary of Nebraska, through wooded canyons for half the distance, dropping in a number of fine waterfalls.



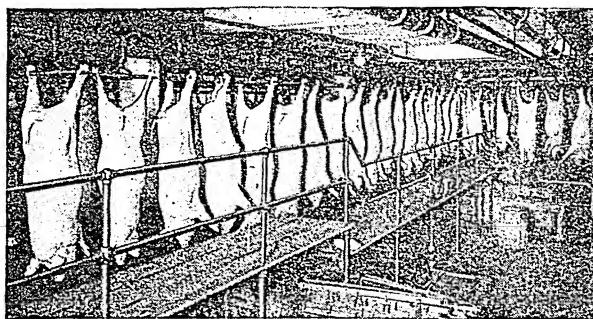
Sheaves of winter wheat stretch for miles during the July harvest before the grain is threshed and shipped.



Largest university in the Missouri Valley is the University of Nebraska, at Lincoln. Below is the university's Agricultural College campus, two miles from the city campus.



Meat packing leads among Nebraska's industries, with a value of more than \$100,000,000 a year in dressed meats and other packing-house products. Shown above are the stockyards of South Omaha, which cover some 200 acres and receive over 7,000,000 head of stock annually.



Here are some of Nebraska's corn-fed hogs on their way through an Omaha packing house. The number of hogs marketed far exceeds the number of beef cattle.

on rough uplands, and to their forethought are due the pleasant groves and tree-lined roads found everywhere. Arbor Day was started in 1872 by J. Sterling Morton of Nebraska City (see Arbor Day). His home, Arbor Lodge, is now a state park.

The name Nebraska, which means "shallow water," was first given by the Indians to the river now called the Platte, which traverses the state. Coronado probably reached the Nebraska region in his explorations in 1540-42. In 1739 the Mallet brothers and eight Frenchmen named the Platte River, which they followed on their way to Santa Fe.

In the Days When Nebraska Was Nameless

In 1803 Nebraska passed to the United States as part of the Louisiana Purchase (see Louisiana Purchase). Between 1810 and 1826 the American Fur Company established posts at Bellevue, Omaha, and Nebraska City. Bellevue, a little below Omaha, was Nebraska's first white settlement. From 1812 to 1821 Nebraska was part of Missouri Territory; then it reverted to the public domain as "Indian country."

"Squatters" pushed in, and in 1854 Nebraska and Kansas became territories, under Senator Douglas' plan to let the settlers settle the slavery question (see Kansas-Nebraska Act). With the organization of the Dakota, Colorado, and Idaho territories, Nebraska was reduced to practically its present limits. In 1864 Congress passed an enabling act to make Nebraska a state; but not until 1867 was a constitution framed and accepted by Congress (over President Johnson's veto). Before the year ended, a dispute over the location of the capital was settled by choosing a site at Lancaster and renaming the place Lincoln. Teams hauled building material 40 miles or more to the site, and in 1869 the capital city was incorporated.

Completion of the Union Pacific to the western state line in 1867 brought floods of immigrants, largely former Union soldiers. The grasshopper plague of 1874-75 caused the constitution of 1875 (known as the "Grasshopper Constitution") to be framed, with a view to economy. A war with the Sioux Indians during 1874-77 ended in the removal of the Indians from the state. The next great immigration period (1880-90) was marked by conflicts between cattle men and homesteaders. Drouths in 1890 and 1894 caused great suffering, and led to the introduction of irrigation and dry farming, with cultivation of sugar beets, winter wheat, and alfalfa as staples. In 1900 the farmers established cooperative elevators to combat the charges of grain dealers and railroads.

In 1919 the legislature made drastic changes in the state government, and in 1920 the voters approved amendments to the state constitution far-reaching enough to create virtually a new instrument. An amendment passed in 1934 provided for a legislature of only one chamber, with 43 members.

More than 87 per cent of the population is native born, and a highly developed school system has reduced illiteracy to an extremely low level. The University of Nebraska is at Lincoln, but has its medical college and nursing school in Omaha, a secondary school of agriculture at Curtis, an

irrigation school at Scottsbluff, and several agricultural experimental stations. Other institutions of higher learning include Creighton University in Omaha, Nebraska Wesleyan University at University Place, Lincoln, and state teachers colleges at Chadron, Kearney, Peru, and Wayne.

The state's chief manufacturing center, Omaha (see Omaha), is the seat of large packing and smelting industries. Lincoln, the capital, is a commercial center as well as an educational center. Its manufactures include food products, agricultural implements, motor trucks, gas engines, and leather goods. Grand Island is a leading live stock market and distributing center, and the seat of the State Soldiers' and Sailors' Home. Hastings, North Platte, Fremont, Norfolk, and Beatrice are important trading centers.

NEBULAE. When astronomers first explored the sky with telescopes they saw many patches of luminous mist or haze. They called such a patch a *nebula*, from the Latin word for "mist" or "small cloud." Until nearly the end of the 19th century, they knew little about these patches; but today nebulae are among the objects which help scientists most in learning how the universe is made up.

For some centuries astronomers have recognized different types of nebulae. The nebula we see in the sword belt of Orion is *diffused*, appearing to be a chaotic, turbulent mass of glowing gas. Some diffuse nebulae are more mistlike, or exist in wisps; the Pleiades are pervaded by such a nebula. The *planetary* type is a glowing ring, with or without a bright star at the center. Most remarkable of all in appearance are the *spiral* nebulae, with twisted arms reaching out from a glowing center.

In 1864 William Huggins, using the newly invented spectroscope (see Spectrum and Spectroscope), found that some nebulae are vast clouds of luminous gases. Later E. E. Barnard proved that the curious "dark spots" or "holes" in the Milky Way are *dark* nebulae, composed of matter which does not give off light. Then scientists found how to make the spectroscope reveal pressure and temperature conditions of heavenly bodies, as well as their chemical constitution. From this they could estimate how much light a nebula should give and so get a good clue to its distance from its brightness.

Soon hitherto undreamed of facts were discovered. The nebula in the Pleiades was found to be 220 "light-years" away, and 30 "light-years" across. To understand what these figures mean, let us compare them with the dimensions of the solar system. This system is so immense that if the earth were the size of a pea, the planet Pluto would be at the edge of a circle $3\frac{1}{3}$ miles in diameter. The nearest star would be 7,500 miles away. But the Pleiades nebula is so huge that it could contain not only the solar system and the nearest star, but many other stars as well.

In the last few years we have learned that the spiral nebulae are more amazing still. Scientists had previously observed, that, while all other types of nebula were to be found in the Milky Way, the spiral type always was found outside. This fact and others led scientists to believe that the stars are not distributed uniformly throughout the universe, as was

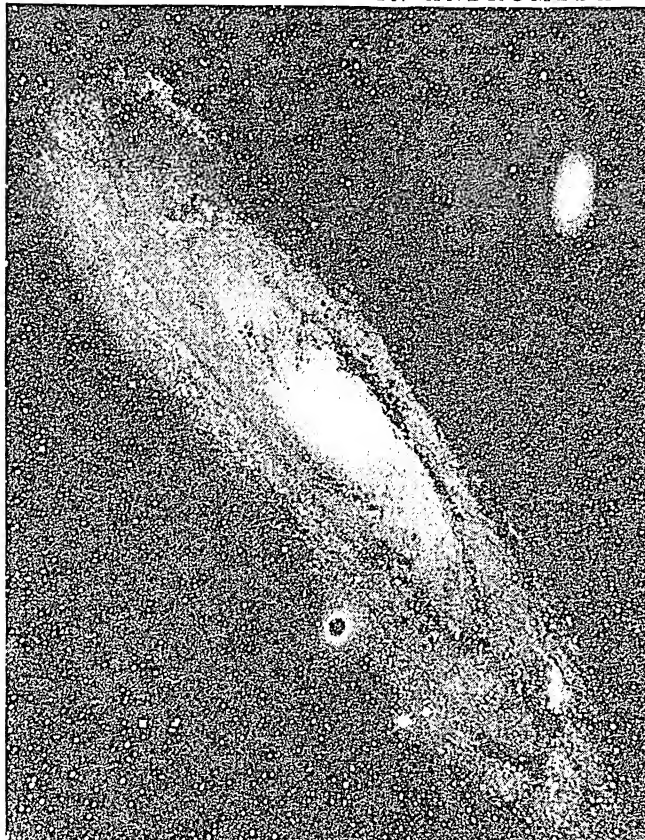
formerly supposed. Instead, they seem to be gathered into groups, so vast that the mind scarcely can conceive their size. These groups are called *galaxies*, or "island universes." The earth and the solar system and all the stars the eye sees make up one galaxy; but there are thousands of others.

After the time of the World War Edwin Hubble and other astronomers began to find amazing facts about the place of the spiral nebulae among the galaxies. We have seen the huge size of the Pleiades nebula; yet it is only 30 light-years across. Our own galaxy is thousands of times greater. Its diameter must be figured in scores of thousands of light-years. But the spiral nebula in Andromeda is probably 900,000 light-years away! The light by which we see it tonight started on its way so long ago that the span of time back to the Stone Age of man seems slight in comparison! The other spirals lie at similar distances.

About a century ago the brilliant French astronomer Laplace advanced the "nebular hypothesis," which held that our solar system was a condensed nebula (see Planets). But nebulae of such size as to be visible 900,000 light-years away are no mere solar systems in the making. Each one is as large as an entire galaxy like our own! Moreover, each spiral nebula seems to be rotating and throwing off matter at its "rim." This matter may condense into stars. So, when we look at the nebula in Andromeda, we are probably seeing an entire galaxy in process of creation. The other types of nebulae, it is thought, will in the course of stellar evolution condense into groups, or "clouds" of stars, within single galaxies.

Nebulae are extraordinarily difficult to study, because only the largest telescopes can gather light enough to tell much about objects so far away. But when we realize their colossal size, we can understand why scientists find them so fascinating to study, and why they are constantly trying to make larger and larger telescopes to learn more about them.

THE GREAT NEBULA IN ANDROMEDA



This great mass of glowing gas, millions of miles across, is just visible to the naked eye as a fuzzy star in the girdle of Andromeda. The picture shows how it looks through a high-power telescope.

NEEDLE. Take a common steel needle and examine it carefully. Notice how highly it is polished and how evenly it tapers to its sharp point. Now hold it to the light. See how wonderfully thin the metal is

on either side of the eye, so that the eye part is no larger than the shaft. Notice how smoothly the edges of the eye are rounded and the inside ground, so that the thread will not catch and fray.

Sometimes we see a needle of a century ago, which has been kept as a curiosity. It is badly formed, one side flatter than the other, the head considerably larger than the body, and it is scratched as if it had been polished with emery paper. Yet such needles are very much superior to those used by uncivilized races today, or to any left us by the ancients. Needles of fishbone, stone, iron, and bronze have been found that were used by early peoples more than 10,000 years ago. Some of these old needles have the eye for carrying the thread

at the point, as in the modern shoemaker's awl; some have it halfway between the head and the point; and some have no eye at all, but were merely used like an awl to punch holes, through which the plant fibers or thongs of leather could be drawn.

Not less than 20 different processes go into the making of a steel needle today. Steel wire, drawn especially for the purpose, is cut into pieces the length of two needles. As the wire has been wound on spools, these little pieces of wire are slightly curved. To straighten them they are gathered into bundles and heated until they glow dull red; as they cool they are rolled to and fro over an iron plate and pressed with a curved bar. Next the wires are carried along to a grindstone and held against its face with a rubber band till a sharp point is put on each end. A rapidly revolving pulley draws these wires from the wheel and feeds them into a machine, which marks the place for the eyes. The eyes are punched by other machines, and the double needles are strung on two slender wires; thus when divided between

the eyes, each row is still strung on a wire. The heads are next filed into shape in a viselike arrangement, and the needles are ground, polished, and tempered, and put up in papers or boxes. Hand sewing needles come in 12 sizes. Nos. 10 to 12, the finest, are used with thread of sizes 100 to 200 (*see Thread*). No. 9 needle takes size 80 to 100 thread; No. 8 takes 70 to 90; No. 7 takes 60 to 80; No. 6 takes 40 to 60; No. 5 takes 35 to 40; No. 4 takes 24 to 35; and Nos. 1 to 3, the coarsest, are used with 8 to 24 thread. There are many other varieties of needles, some for use on sewing machines, some for sewing canvas, leather, upholstery, etc.

NEGRO. The negro race in the broad sense includes the woolly-haired, thick-lipped, broad-nosed, black or dark brown inhabitants or former inhabitants of Africa. From middle Africa, where the pure negro is found, the type shades off by gradual and imperceptible steps into the Semitic (Arab) and Hamitic (Egyptian and Libyan) types in the north, and into the Bushmen and Hottentots in the south. (*See Africa*.) Outside of Africa, types resembling the negro, called "negroids" and "negritos" exist on some of the larger islands and coasts of the western Pacific Ocean, notably in certain parts of the Philippines, on the Malay peninsula, and in Australasia.

Through importation as slaves, the true negro types are found in almost all parts of the two American continents, largely mixed with white and native Indian blood. The mixture of negroes and Indians occurs chiefly in Central and South America. In Brazil, where the slave trade with Africa continued until 1854, the negro elements form today a large proportion of the population (*see Brazil*). In Cuba, Haiti, Jamaica, and throughout the islands of the West Indies the black race predominates.

In the United States, an exceptional situation exists, for the races have not blended together to the extent elsewhere. A sharp line of distinction is drawn between whites and blacks; and all who have negro blood, even in a small proportion, are classed generally as negroes.

The First Negroes in America

The negro question in the United States dates back to 1619, when 20 slaves were landed and sold in the Virginia colony. The importation of negroes, chiefly from the Guinea coast of Africa, continued until 1808, when it was forbidden under a provision of the Constitution. At that time there were about 1,400,000 blacks in the United States. At the close of the Civil War, this number had increased to about 4,500,000. Today there are roundly 12,000,000, excluding those in Porto Rico and other dependencies. The majority of these are in the Southern states, where they form more than one-third of the population. It has been estimated that something like 60 to 75 per cent of all the negroes in the United States have at least a trace of white blood.

From the moment the negro slaves were freed by the Civil War, a host of social, political, and economic

questions arose. The sudden political power which was thrust into their inexperienced hands confused them and created great disorders, especially in the South (*see Civil War and Reconstruction*).

As an industrial worker, the negro often finds the color-line drawn against him. With the growth of labor unions, the door to many of his former employments is slowly closing. Although the unions do not usually bar him in theory, many obstacles are put in the way of his membership, and he is compelled to do unskilled work at lower wages.

Despite these handicaps, the negroes are making steady progress in wealth and education. Many are successful in politics and as merchants, bankers, teachers, actors, writers, musicians, doctors, dentists, lawyers, preachers, and engineers. Negroes make up 28 per cent of the farm population of the South, but they are steadily migrating to the cities, especially in the North. New York, Chicago, and Philadelphia have a larger negro population than any of the southern cities; and New York state has more than half as many negroes as Louisiana.

World War Started Negroes Northward

The movement of negroes to the northern cities reached its height during the World War of 1914-18, because men were needed for war manufactures and because the halting of immigration had reduced the supply of labor. After the war this increase in the number of negro industrial workers resulted in competition with the whites for jobs, with racial outbursts in several large cities. However, the restriction of immigration in recent years has helped the negro hold his place in the industries of the northern cities, and the development of the South has made jobs for him in that section's new steel and cotton mills and its many factories.

Until after the Civil War no serious effort was made to educate the negro. In fact, the slave was often forbidden by law to learn to read and write. As soon as he gained his freedom, church societies in the North began the great task, and large numbers of men and women teachers went into the South and started schools. The Freedmen's Bureau provided government aid from 1865 to 1870. The Hampton Institute, located at Hampton, Va., which was opened in 1868, is perhaps the best example of this private work for the education of negroes. From this school was graduated Booker T. Washington, the greatest educator of the negro race, who later founded the famous Tuskegee Normal and Industrial Institute in Alabama (*see Washington, Booker T.*). Another prominent negro educator, Robert R. Moton, who had been teaching at Hampton Institute for 25 years, succeeded Booker Washington as president of Tuskegee Institute.

The number of educational institutions for negroes supported by private endowment has gradually increased in both North and South, and public school facilities for them are improving. As a result the census of 1930 showed that the percentage of negro illiterates was only 16.3, as compared to 22.9 in 1920.

The corresponding figures for whites were 2.7 in 1930, and 4.0 in 1920. The Southern Education Foundation, Inc., administers the George Peabody, the John F. Slater, the Anna T. Jeanes, and the Virginia Randolph funds to improve educational and living conditions of negroes. The Julius Rosenwald Fund has similar aims (see *Philanthropy and Charities*).

Many negroes, with their dancing feet, infectious grin, and mellow voice, are born entertainers. Paul Robeson and Roland Hayes won fame on the stage and in concert. Negro spirituals and "blues" have a haunting sadness and melody. Jazz music is of negro origin. One story has it that Jazbo Brown, a tramp entertainer, first played jazz along the Mississippi in the 90's. Among noted negro composers have been James Bland, author of 'Carry Me Back to Old Virginny'; J. Rosamond Johnson, and William E. Still. Charles W. Chestnutt, Countee Cullen, Langston Hughes, W. E. B. DuBois, William S. Braithwaite, Claude McKay, and Paul Laurence Dunbar have written of their race skillfully and with power. Negro folk-lore is famous. The race has expressed itself in art in the sculpture of Meta Warrick Fuller and May Howard Jackson, and in the paintings of Henry Ossawa Tanner, Archibald Motley, and others.

NELSON, ADMIRAL HORATIO (1758-1805). The most famous naval commander of the greatest maritime power in history was, like James Watt, so frail that he was not expected to live to maturity. His father's small income as rector of the little parish of Burnham-Thorpe in Norfolk forced the boy to leave the home nest at 12 and enter the navy as a midshipman. His uncle, on whose vessel he made his first voyage, thought that the delicate boy never would make a good sailor, and that the most merciful course would be to discourage him. So the first day at sea he ordered the boy aloft, saying, "You are afraid, lad?" "Yes, sir," replied the shivering morsel of a man, "I'm afraid, but I'm going to the top of the mast, sir." And go he did. But he never forgot that sickening experience, and when at the early age of 21 he was captain of a frigate, he used to race the new boys up the mast and salute them at the top. The little fellows, frightened half to death but full of British grit, never disappointed him. He abolished some of the severe punishments then practiced, saying that cruelty made cowards. He promoted brave men and treated members of the crew with great consideration. As a result his ships soon were famous.

Nelson's rise to fame began in 1793, during the war with Revolutionary France, when he was put in command of the 64-gun ship *Agamemnon*. Repeatedly during the next three years he distinguished himself by bravery, coolness, and judgment. During one of the famous engagements of this period—the battle of Calvi—he lost his right eye; and not long after, in a disastrous assault on Santa Cruz, in the Canary Islands, he received a wound which cost him his right arm.

HORATIO NELSON



"The most famous naval commander of the greatest maritime power in history."

His heroism was rewarded by a pension, knighthood of the Order of the Bath, and promotion to the rank of rear-admiral. Now came Nelson's great chance. He was assigned to hunt out and destroy the fleet by which Napoleon hoped to invade Egypt and strike England in her most vulnerable spot—India. On Aug. 1, 1798, he attacked the French ships in the Aboukir Bay at one of the mouths of the Nile. "Where there is room for a French ship to swing at anchor," he said, "there is room for an English ship to sail"; so he boldly sent half his fleet into the narrow space between the French ships and the shore, while the rest at-

tacked from the seaward side, thus raking the enemy from both sides. This smashing victory of the Battle of the Nile, as it was called, made the one-eyed and one-armed admiral the idol of England. He was raised to the peerage as Baron Nelson of the Nile; and wealth and honors were heaped upon him.

Three years later (1801), when he had become vice-admiral, Nelson was sent to coerce the Baltic states, winning a notable victory over the Danish fleet at Copenhagen. In the midst of the battle Nelson's superior hoisted the signal of recall. Putting the telescope to his blind eye, Nelson said: "I really do not see the signal," and turned what might have been disaster into triumph. For this exploit he was made a viscount.

The Great Battle of Trafalgar

After a few months of leisure, Nelson was called from retirement to defend England once more from the menace of Napoleonic invasion, and put in sole command of the Mediterranean fleet. For 14 months he lay off the port of Toulon. When the French fleet slipped out, he chased it to the West Indies and back; laid siege to it and the allied Spanish fleet in the harbor of Cadiz; and brought them both to bay off Cape Trafalgar (Oct. 21, 1805). In going into battle Nelson flew from the mast head of the *Victory* the signal that ever since has been Britain's watchword: "England expects that every man will do his duty."

The fleets of the enemy were destroyed by Nelson's skilled attack, but in the hour of triumph the great commander fell mortally wounded. As he lay dying, wild cheers rang out as ship after ship of the enemy struck its colors or sank beneath the waves.

"England is safe," he murmured, looking up into the face of the officer who bent above him. His simple loving heart turned like a boy's to his old comrade in arms for the last office of affection, as he murmured: "Kiss me, Hardy." His last words, before his soul drifted to the Great Unknown, were: "I have done my duty, thank God!"

His flagship brought the news of the victory home, but its flags were at half-mast. England's "greatest seaman since our world began," as Tennyson called him, was laid away in St. Paul's Cathedral, London. **NEMESIS** (*nēm'ē-sis*). The personification of divine justice, Nemesis, was represented in earlier Greek mythology as a goddess, the daughter of Night. The name meant originally the one who measures out; hence she was regarded as the one who distributes good or bad fortune to each man according to his deserts, and punishes any violation of justice or any arrogance or presumption on the part of men. Later she was thought of only as the angry avenger of crime, pursuing the evil-doer relentlessly like the Furies or Erinyes (*see* Furies). She was sometimes represented as carrying a measuring rod, a bridle, a sword, and a whip—emblems of her functions.

NEPTUNE. In Roman mythology the name Neptune is given to the Greek sea-god Poseidon. He is usually shown as a bearded man standing in a shell drawn over the sea and holding a three-pronged spear or trident (*see* Poseidon).

In astronomy the name Neptune is given to an outer planet in our solar system. Neptune is 30 times as far from the sun as the earth, and is invisible except through powerful telescopes. Its discovery in 1846 came as the result of certain investigations in the movements of Uranus, which led two astronomers to predict the presence of an unknown planet at the exact place where the telescope revealed Neptune. This large planet is over four times the diameter of the earth and takes 164 earth years to go around the sun. (*See* Astronomy; Planets.)

NERO, EMPEROR OF ROME (37-68 A.D.). Lucius Domitius Ahenobarbus Nero, who has become a synonym for a monster of iniquity and cruelty, began his reign in the year 54 A.D. at the age of 17, a handsome, talented, and by no means bad-hearted youth. Although Nero owed his throne to a crime, the blame for this rested on his wicked mother Agrippina, whose ambition for her son knew no bounds. She married the emperor Claudius, and influenced him to put aside his own son, Britannicus, in favor of Nero. Then, impatient to see her son on the throne, she caused Claudius to be poisoned.

The Romans looked with favor upon Nero, since he was descended on both sides from the great Augustus. Under the influence of his tutor, Seneca—a

wise philosopher and brilliant writer (3 B.C.-65 A.D.)—all went well for a year. Then Nero's evil traits began to develop. Worst of all, he was cowardly, and committed one crime to cover up another. He caused Britannicus to be poisoned in 55 A.D., and four years later had his own mother slain by swordsmen. He divorced and later put to death his wife Octavia. He killed his second wife Poppaea Sabina in a fit of rage. A third woman who refused to marry him was slain, and he killed the husband of a fourth woman so she might become his wife. He was insanely suspicious of all his associates. Upon discovering a plot against him, he had Seneca put to death, together with many other famous men.

Did Nero Fiddle while Rome Burned?

During his reign a great fire broke out in Rome which burned for a week and destroyed more than half the city. It was rumored that Nero himself had started the fire and that, as he watched the conflagration, he played upon his fiddle and recited verses about the burning of Troy. Historians agree that there was probably no foundation for this charge, but at that time many believed it. In order to free himself from suspicion, Nero fastened the blame upon the Christians, and caused numbers of them to be put to death with the most cruel tortures. This is considered the first of the ten great persecutions of the Christians under the Roman Empire.

After the fire, Nero set about rebuilding the city, and erected for himself a magnificent palace called the "Golden House." But his heavy taxation, misgovernment, and cruelty caused discontent and then revolt in the provinces. The rebellious troops under Galba, the Roman governor of Spain, marched upon Rome and were joined by the emperor's own bodyguard. Nero fled, and news came to him in his hiding place that the Senate had sentenced him to death and proclaimed Galba emperor. At the approach of horsemen who came to drag him to execution, Nero commanded an attendant to stab him to death, exclaiming, "What an artist dies in me!"

Thus passed away the last of the Augustan line of Caesars. His enthusiasm for art and any other good qualities he may have had were soon forgotten, and his name is one of the blackest in history. (*See* Roman History.)

NERVES. The nerves are the telephone system of the body. They connect every part of it with the spinal cord and brain, and through this central switchboard all the organs and limbs are placed in communication with one another. Thus the nervous system controls the activities of the body, unifying the motions of the different parts so that each plays its proper rôle in any particular activity instead of moving independently. When the nerves in a limb or organ cease to function, that part of the body becomes paralyzed. It loses all feeling and cannot move.

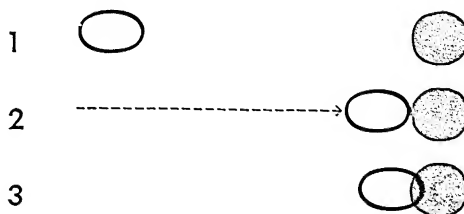
The nerves are also responsible for the messages that reach the body from the outside, for they bring in the information gained through the senses.

The Story of the Nervous System I

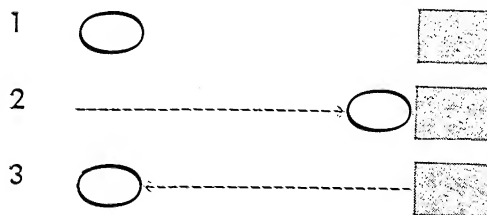
Simplest Type of Behavior

Nerves help to explain behavior. On this page are three examples of how lower forms of life get food. Differences in the behavior of these creatures are the result of differences in their nervous equipment.

One-Celled Organism and Food

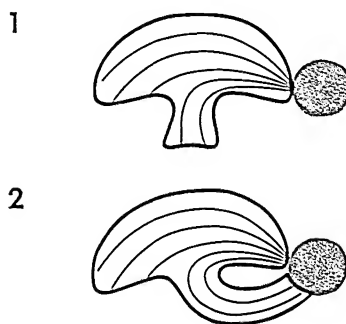


One-Celled Organism and Obstacle



Nervous System Appears

Many-Celled Organism and Food

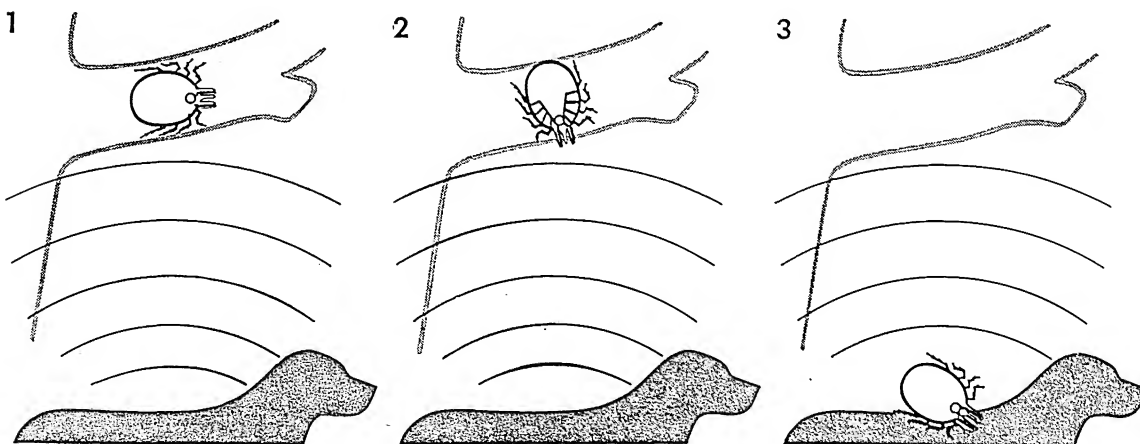


The one-celled organism—a paramecium, for instance—has no system of nerves. When it comes in contact with anything, it acts in only one of two ways. If the thing touched is attractive, the cell moves forward and surrounds it. If the thing is not attractive, the cell moves away. The cell acts as a whole; aside from the simple mechanism that moves it from place to place, it has no special parts for doing special things—no mouth to open, no eyes to guide it.

Our second example is a jellyfish, with a network of nerves represented by green lines. This very simple nervous system makes possible more complicated action than the one-celled creature can perform. When the jellyfish comes in contact with food, for instance, its mouth automatically moves around to the point of contact and swallows the food.

Our third example is a wood tick. Here we see what can be done by an organism with a centralized nervous system, which receives messages from different senses (touch, sight, etc.) and, in response, sets going a complex series of appropriate actions. The tick rests on the branch of a tree. A dog comes near; the message of his presence (circular lines) reaches the tick and passes through its sensory nerves (green) to the nerve center (black ring). From here messages go out along another set of nerves (blue) to the legs. As a result the tick turns around, drops off the tree to the dog's back, and begins to feed.

Centralized System Appears

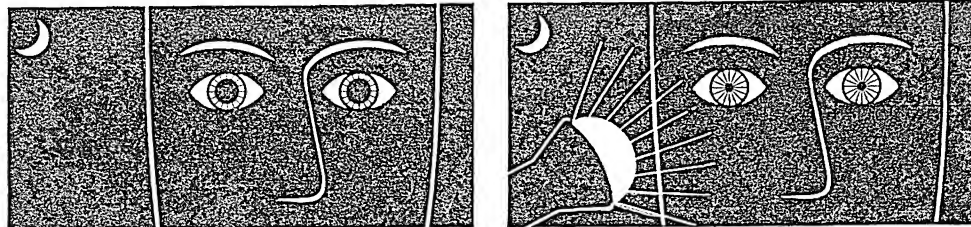


The Story of the Nervous System II

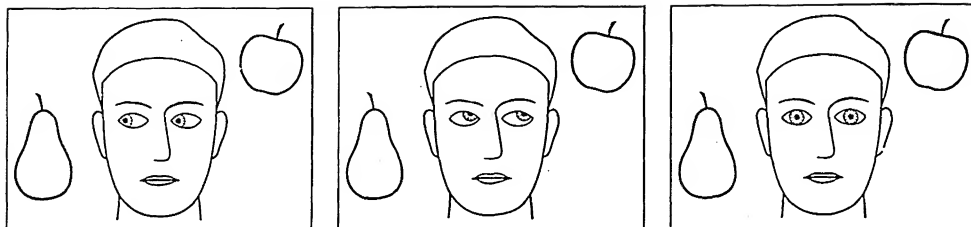
The types of behavior illustrated on the previous page are automatic. Here we show how the twofold nervous system of higher animals provides for both automatic and voluntary actions. Eye movements provide examples of both types of behavior—first, the reaction of the pupils to light and, second, the movement of the eyeballs.

Twofold Nervous System of Vertebrates

Experiments with the Eyes



We cannot control the contraction of the pupil



But we can turn our eyes where we wish

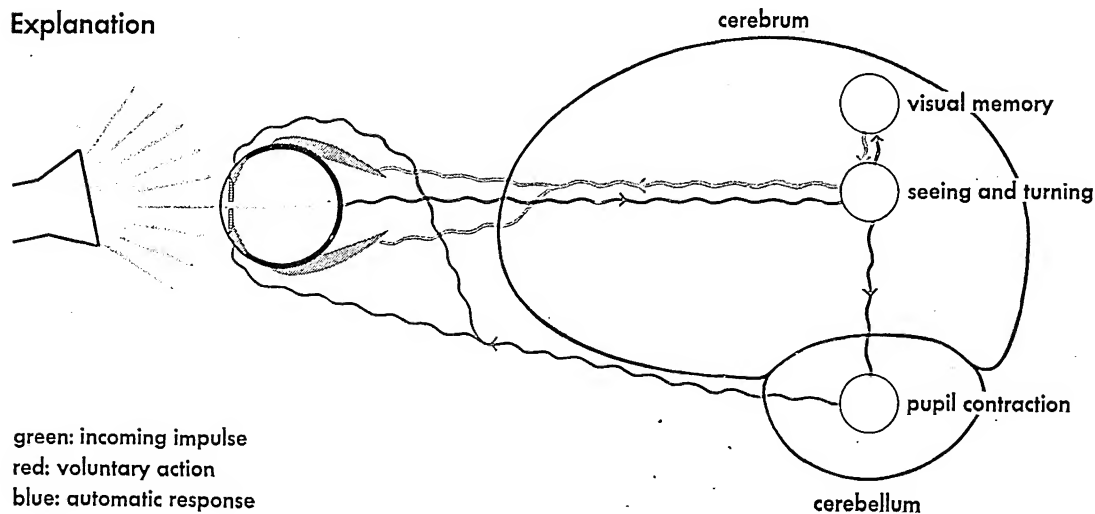
looking at the pear

looking at the apple

looking forward

After looking at the pear and at the apple, the man can remember both and decide which one he wants to reach for and eat. How these actions are related to the nervous system is explained by the diagram below.

Explanation

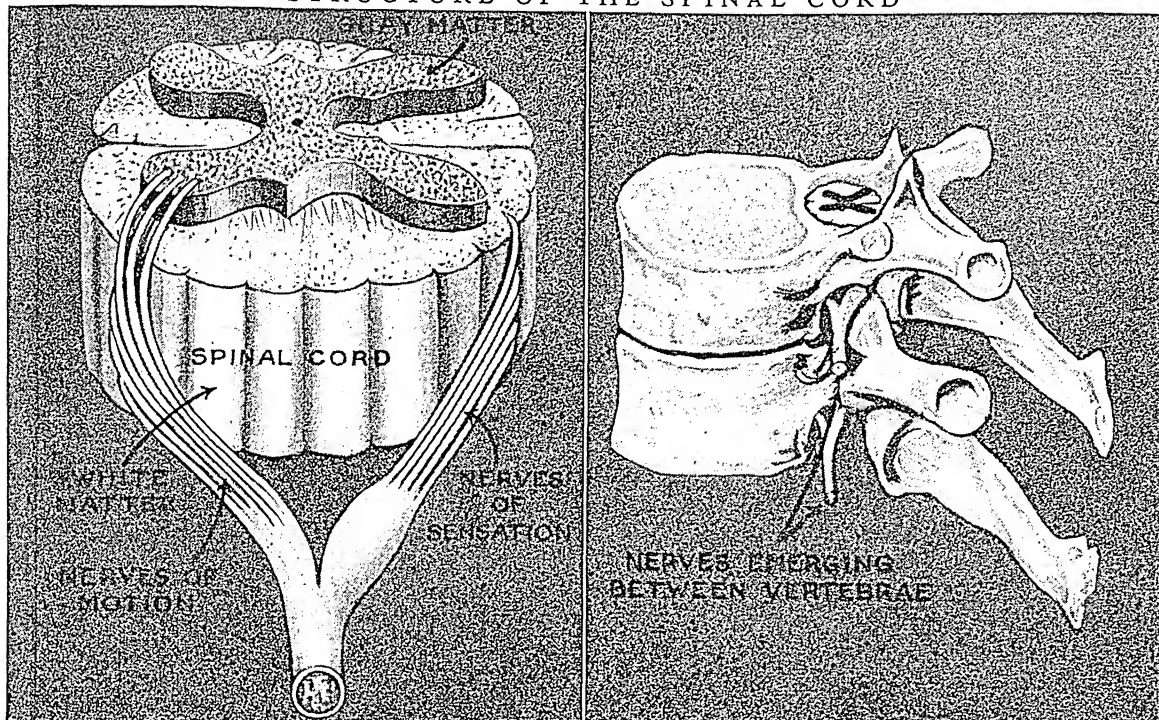


When bright light enters the eye, the optic nerve carries the message to the seeing center of the brain. Instantly the message is relayed to the pupil contraction center, which automatically sends out to the muscles of the pupil the impulse to make the opening smaller. The examination of pear and apple also involves the seeing center, but is completed through another set of nerves. These carry the eye messages to the visual memory center where the fruits are recognized. Here also originates the impulse that controls the turning of the eyes from one fruit to the other. The choice between them involves still other centers, not shown, such as the taste memory center.

Unlike the city telephone system, each of the nerve wires or fibers carries messages only in one direction. Many of them, besides, are special "private cables," each one used for a particular kind of business and that alone. For example, the optic nerve takes care of "sight" messages only; the auditory nerve of "sound"; the olfactory of "smell," and so on.

lations of the body with the outside world. All the sensations of which we are conscious—touch, sight, taste, hearing, smell, feelings of heat and cold—come to us through this system. And all our outward actions are controlled by it. The autonomic system, on the other hand, governs our internal processes—the beating of the heart, the circulation of the blood,

STRUCTURE OF THE SPINAL CORD



The picture on the left represents a section of the spinal cord, with its structure emphasized to bring out its parts clearly. The view is from the left and shows sensory nerve fibers entering the cord at the back, and the motor fibers emerging from the front. The right-hand picture shows two vertebrae, with the location of the spinal cord marked by the cross-like appearance of its gray matter.

A nerve circuit in its simplest form consists of (1) a *receptor* or sense organ, (2) *afferent* or *sensory* fibers which carry the incoming message from the receptor, (3) a *nerve center* which receives the message and determines the response, (4) *efferent* or *motor* fibers which carry the outgoing message, and (5) an *effector*, the muscle or gland which obeys the message. Usually both afferent and efferent fibers of the same circuit unite for most of the distance into a single bundle or cable. The character of the response may be dictated or modified by other centers and circuits connected with the simple one described, but each circuit works in the same general way. The nature of the separate nerve cells and the connections between them in a circuit are described in the article *Brain*.

The Two Chief Nerve Systems

The nerve circuits of the body fall into two great groups. Those whose centers lie in the brain or spinal cord form the *cerebrospinal nervous system*. Those whose centers lie on each side of the backbone and among the chief organs form the *autonomic* or *sympathetic nervous system*. In general it may be said that the cerebrospinal system takes care of the re-

movements of the stomach and intestines, the work of the glands, and all the other functions of our tissues and organs that go on without conscious effort on our part and that are generally speaking beyond the control of our will (*see Physiology*).

The word "autonomic" must not be confused with "automatic" when applied to nerve reactions. The majority of nerve circuits in the cerebrospinal system are capable of automatic reflex action, as when the hand jerks away from a pinprick or a hot coal. But we can sense these automatic reactions after they have taken place, whereas most of the work of the autonomic system is carried on entirely without our knowledge.

Interaction of the Two Systems

The two systems are, however, connected by nerve fibers rooted in the spinal cord and running out to the autonomic centers. These connections explain the close interaction between the two systems—the fast heartbeat caused by mental excitement, the mental depression caused by a disorder of the stomach or intestines, and a host of other relations between our emotions and our physical machinery. (*See also Sensation and Perception; Ear; Eye; Smell; Taste; Touch.*)

LITTLE HOLLAND'S PICTURESQUE LAND and PEOPLE



NETHERLANDS, KINGDOM OF.

A little country about the size of Massachusetts and Connecticut together, the Netherlands—popularly called Holland from its chief province—consists of the delta land of three great rivers, the Rhine, the Meuse (or Maas, as the Dutch themselves spell it), and the Scheldt. Almost half of the land, including the three largest cities, Amsterdam, Rotterdam, and The Hague, lies below sea-level. The shores of sea and rivers alike are diked, and thousands of windmills with ladder-like sails are kept busy pumping water back into the sea. The dikes must be carefully built and carefully guarded, for Holland had its warning more than 500 years ago when the North Sea swept into the very heart of the country, covering hundreds of towns and villages and forming the Zuider Zee, a great bay about 80 miles long. A law passed in 1918 provided for reclaiming much of this area. A massive sea dike 18½ miles long has been built across the mouth of the Zuider Zee. Back of the dike four separate areas, called polders, totaling 550,000 acres, are being drained and made into farms. What is left of the old salt-water Zuider Zee, open to the tides and storms of the North Sea, is now the quiet fresh-water IJssel, or Yssel, Lake. (For maps, see Belgium; Europe.)

When you visit Holland you will think that it looks like no other country in the world—with its flat

Extent.—North to south, 210 miles; east to west, 120 miles. Area, about 13,000 square miles, exclusive of gulfs and bays. Population, 7,920,000. Colonies: Dutch East Indies (Java, Sumatra, Borneo, Celebes, etc.); Dutch West Indies (Dutch Guiana or Surinam, and Curaçao including St. Eustache, part of St. Martin, etc.). Area of colonies, about 788,400 square miles; population about 60,000,000. *Natural Features.*—Level surface, with almost all the coastal portion below sea level and protected by dikes and extensive drainage systems; mouths of Rhine, Maas (Meuse), and Scheldt rivers. *Products.*—Butter, cheese, and milk; flower bulbs, rye, oats, potatoes, sugar beets, and wheat; herring and oysters; coal; cut diamonds, ships, textiles, flour, shoes, margarine, brick and tile, machinery, printed matter, cocoa, chocolate. *Cities.*—Amsterdam (capital, 750,000), Rotterdam (580,000), The Hague (seat of government, 435,000), Utrecht (150,000), and Haarlem, Groningen, Eindhoven, Nijmegen, Tilburg, Enschede, Arnhem, Leyden (all over 70,000).

meadows, its canals with their barge population of 50,000 to 100,000 who live their whole lives in those quaint boats with bright red cabins and miniature gardens, its storks, its windmills, and its red-roofed villages. Black and white cows

speck the meadows, some wearing garments to keep out the cold; and the more aristocratic eat from mangers lined with red and green tiles.

The people of Holland are as attractive as the land. The Dutch are known the world over for their quaint costumes varying with the districts—the wooden shoes and baggy trousers of the farmers, and the queer neat caps worn by the women in many provinces. In the cities, however, they look like the best and most alert type of Englishman, well dressed and well educated, with clear ruddy complexions; and often they speak English almost as well as Dutch, for trade and travelers have made the Dutch business man of necessity the master of several languages.

Today the Netherlands are a commercial nation, dealing in coffee, cocoa, chocolate, and tropical spices from their wide colonial possessions in the East Indies (see East Indies), the West Indies, and South America. The Netherlands once possessed a greater colonial empire than England, and the colonies it still rules are more than 60 times larger than the motherland. Chief among the imports of the Netherlands are iron

DRESS IN THE LAND OF THE DUTCH



Many of the Dutch country people still wear the old local costumes, especially on holidays. Dresses and caps differ from district to district. The high peaked shoulders on the girls at the left above tell us that they are from Axel near Antwerp. The man and his wife (2) are fisher folk from Scheveningen, a seaside resort town. The two girls in the center (3) with their winged caps are from the fishing village of Volendam. The bottom picture (4) shows a home on the island of Marken. Notice the earthenware plates that decorate the walls and the beautifully designed fabrics in costumes and draperies.

IN THE GREAT DUTCH CITY OF ROTTERDAM



Would you imagine from this picture that some of the principal "streets" of Rotterdam are canals? In the middle distance, just this side of the great church, you can see a bridge over one of them, while another is passing under a street in the lower right-hand corner of the picture. Rotterdam, situated on a branch of the Rhine-Meuse Delta, is one of the greatest of the world's seaports, receiving not only a great amount of sea traffic but a vast quantity of canal shipping. The public buildings, built in modern style, form an interesting contrast to the quaint houses with wooden gables that belong to older days.

and steel, textiles, coal and coke, lumber, machinery, wheat, corn, and linseed; and among its exports are meats, textiles, butter and cheese, eggs, coal and coke, wireless equipment, and vegetables.

This low wet country with its sweet pastures is one of the world's best known dairies. The people make thousands of pounds of butter and cheese. Dutch horses are also noted. The Dutch have in times past gambled in tulips, as our own financiers gamble in stocks, and these, together with hyacinths and other bulb plants, form as important an industry as the raising of vegetables. No other part of the world has a greater harvest per acre of wheat, rye, and oats. Potatoes, sugar beets, flax, and barley are other crops. The farms are small, some no larger than two acres, so that little machinery is used on them, instead, they are intensively cultivated by hand. Wood and stone are so scarce that farmers fence off their fields with ditches or hedges. The sturdy seaside fishermen net large catches of herring, flounders, eels, oysters, and mussels. Coal is mined in the southern province of Limburg. The country has few other minerals, except

peat and salt, because it is made up chiefly of soil brought down by rivers.

The machine age did not progress in the Netherlands until the end of the last century, being handicapped by the lack of iron and coal. The Netherlands is one of the foremost ship-building nations. Cotton weaving, diamond cutting, flour milling, and printing are ranking industries; and machinery, woolen goods, condensed milk, and chocolate are important products.

Closely Linked Cities

Traveling in little Holland, you will be surprised that its large cities are so close together, some not so far apart as an American city and its suburbs. From Rotterdam, a ride of an hour and a half on a Maas steamboat will take you past fisheries, shipyards, and meadows to the much painted city of Dordrecht, whose four rivers and the connecting canals will remind

you of Venice. Dordrecht was once the richest town in Holland, and it is still one of the most beautiful, a favorite with painters.

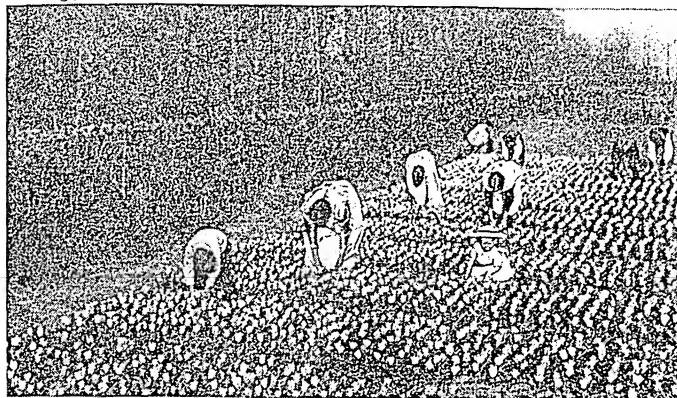
A little steam barge will take you by canal from Rotterdam to Delft, long famous for its potteries

"LITTLE OLD MEN"



Many Dutch children wear exactly the same costume, on a smaller scale, as their elders. Here we see the famous long baggy trousers, caps, and wooden shoes which mark the old-fashioned Hollander.

TULIP BEDS AND TULIP BULBS



It seems a pity, doesn't it, to throw away all those pretty tulips, but the flowers are raised for the sake of the bulbs, and the whole family, you see, including girls like that little tot, help to keep out the weeds. Then, when harvest time comes, the bulbs are pulled up, stored in bins (as shown on the right), and great heaps of the beautiful flowers and their stems are piled up in the corners of the fields and allowed to rot, so that they may be put back again to fertilize the land.



and its quiet picturesqueness, and for the fact that it contains the tombs of William the Silent and Grotius. Not far north of Delft lies The Hague, the kingdom's center of government. From there it is only a short distance to Scheveningen, once a simple fishing village retaining old customs and costumes, but in modern times a fashionable watering place. Only a little farther away is quaint old Leyden. For its bravery under Spanish siege in 1574, William the Silent gave Leyden its choice between exemption from taxes and a university. It chose the university. A little farther north is Haarlem, in the heart of the tulip country. Here in April the flat lands are covered for miles with gorgeous blooms.

All these places are in the forty-mile stretch from Rotterdam to Haarlem; and ten miles east of Haarlem is the country's largest city, Amsterdam. From there short trips can be made to such places as Marken, a fishing village before the old Zuider Zee was drained, and still noted for picturesque native dress. Near by is Edam, the home of round red cheeses and once the seaport of Amsterdam, before Amsterdam had a canal to the North Sea. About 18 miles north of Amsterdam is Alkmaar. Here every Thursday afternoon farm carts unload yellow cheeses; they are flung about like enlarged baseballs as they are arranged for the famous Friday cheese market.

About 20 miles south and a little east of Amsterdam is Utrecht, "the city of spires" and also of bridges—about 95 of them, at a conservative count. Here the northern provinces organized their resistance to Spain in 1579, and the peace treaty between France, England, and Austria was concluded in 1713. Here too, about 30 miles east and a bit north of Rotterdam, is the eastern limit of the land which has been recovered from the grip of marshy rivers and the sea.

All this region, so closely packed with cities and towns, is known to geography and history as "Holland." Farther east, along the Rhine, the Waal, and the Maas,

the land rises gradually until it presents low, wooded hills. Here are located Nijmegen and Arnhem. The land east of the Zuider Zee also is above sea level; among its cities are Groningen and Enschede. South of the rivers toward Belgium are Eindhoven and Tilburg. The southwest, where the rivers flow through estuaries into the North Sea, is called Zeeland.

The Menace of the Waters

The ever-present menace of the gray sea waters has made the Dutch serious, hard working, prudent, and watchful. A strong patriotism has arisen too out of their common danger and the constant need to protect the dikes. A saying goes, "God made the world, but the Dutch made Holland." The Dutch dikes along sea and river are among the world's great engineering achievements. The sea itself has tossed up a natural barrier in the sand dunes which line the coast. The Dutch reinforce these dunes with dikes built of stone, clay, and earth on foundations of concrete posts or long wooden piles. The stork is liked in Holland because the bird eats the dread teredo, a worm which bores into the piles. Some of the larger sea dikes, 200 or 300 feet wide, are as tall as three-story houses, with highway or railroad running on their tops. The rich farm lands wrested from the waters and protected by dikes are called "polders." Excess water is pumped off them into the canals. Much of the Nether-

lands most fertile farming area consists of land which has thus been reclaimed in order to support its dense population of more than 630 to every square mile. Although small farms are still numerous, the movement of the population toward the cities has been increasing rapidly in recent years.

In Holland, you see bright peasant cottages—some with blue walls and yellow roof, others lavender and rose, made brighter by gay-colored window blinds. And always there is a neat little garden in front, often enclosed by a hedge clipped in bird and animal shapes. Dutch homes are usually of brick, because wood and stone are scarce, and their roofs are tiled or thatched. Barn and house are frequently under one roof to save room—the thrifty family in back, the cattle in front, in quarters as clean as the house. The walls of the well-scrubbed rooms are gay with tiles and paint.

Clothes, food, and even the beds of the home-loving family are kept out of sight in big wall cupboards. Stoves and fireplaces heat the cozy homes, for the climate is damp and cool, with real cold in winter and few hot days in summer. Outside the house are rows of wooden shoes, or "klompen," which the country folk wear with woolen socks and straw because

or the damp ground. They walk around the house in stocking feet or slippers. Boats are tied in front of houses along the canals as commonly as automobiles are parked at curbs in the United States.

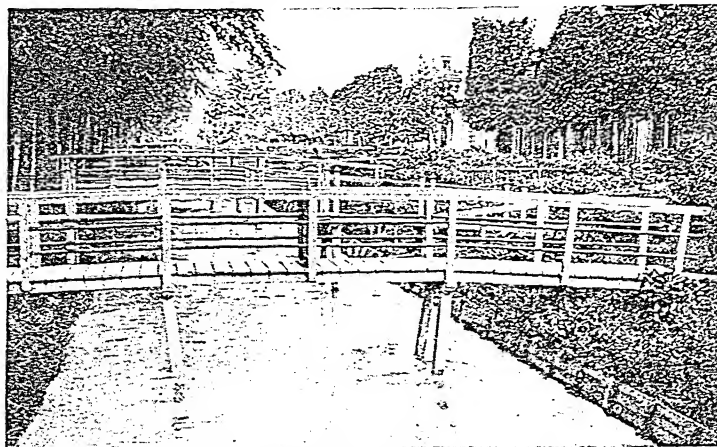
Cool climate and hard work give the Dutch enormous

appetites, and they eat three wholesome meals a day, besides their morning coffee and afternoon tea. The cities have running water from the springs welling up at the base of the coast dunes, but the villagers go to the village pump for water to supply their daily household needs.

Canals and rivers provide the chief means of transportation for passengers and freight.

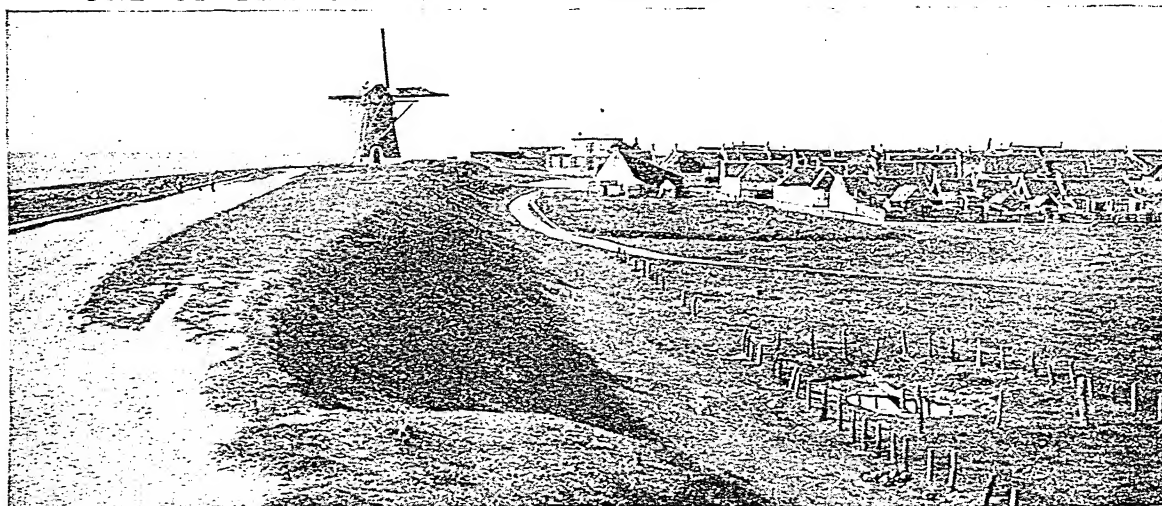
There are over 4,500 miles of navigable waterways, as compared to about 3,000 miles of roads—narrow and usually of brick—and about 2,300 miles of railways. Bicycles are so numerous they actually cause traffic jams in the larger cities. Bicycles are easy to ride in this flat land, and besides they require neither garages nor fuel. Dogs are generally used to pull the big-wheeled milk and vegetable carts, because they cost less to keep than horses. In winter, when the canals and rivers are frozen over, the entire population, young and old, puts on skates and takes to the ice both for pleasure and for business.

CANALS IN THE FRONT YARDS



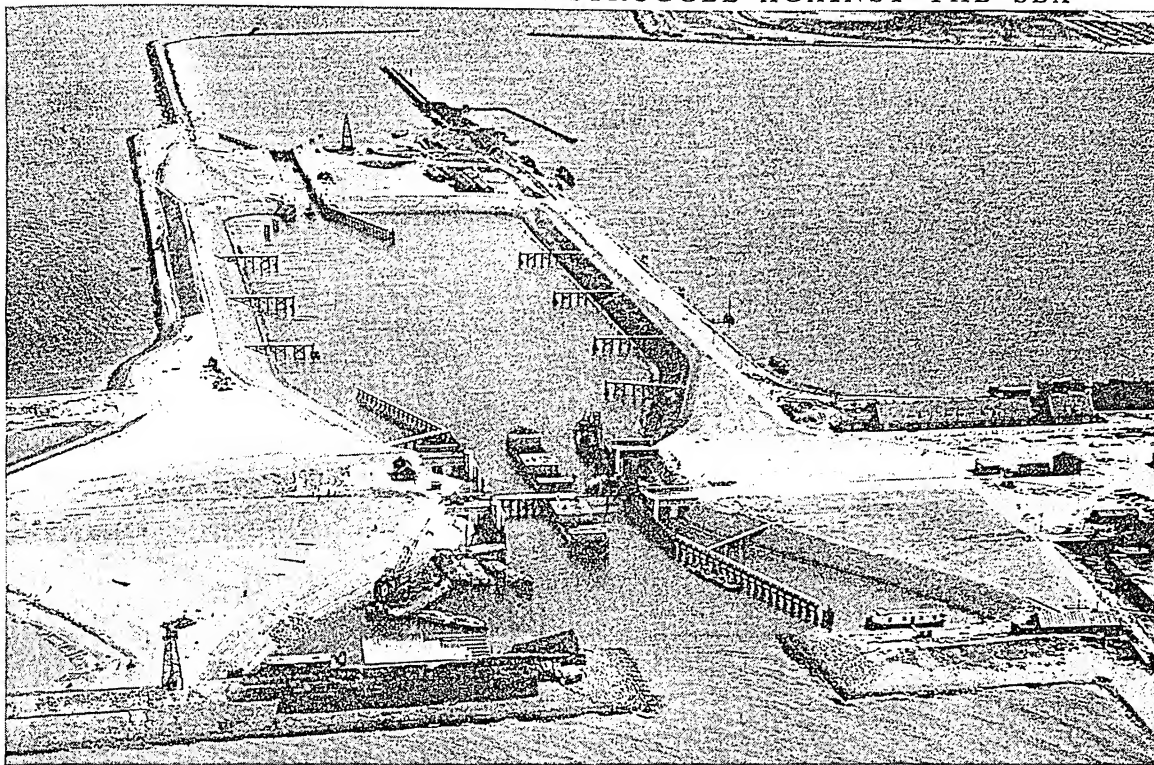
Just as the click of the front gate latch marked father's home-coming when fences were popular in America, so a familiar tread on one of these little bridges announces the home-coming of many a Dutch burgher. Each bridge connects a house on the right with the road behind the trees on the left.

ONE OF THE GREAT DIKES THAT HOLD BACK THE SEA



Aren't they massive structures, these Holland dikes? But, of course, they have to be. It's a big job to keep the sea from breaking through! When gales rage at sea the giant waves batter them with incredible force. See the great old-fashioned windmill on the dike, a type still common in Holland.

HOLLAND CONTINUES HER STRUGGLE AGAINST THE SEA



For centuries Holland has been patiently pushing back the waters that cover valuable land. One of the greatest tasks has been to drain the Zuider Zee, an immense flood which swept inland more than 500 years ago. Now with the aid of modern machinery, the end of this long battle is in sight. Here is a view of a part of the great project begun in 1920 to reclaim 550,000 acres of rich farming land. The plan was conceived by C. Lely, a young engineer who became minister of public works.

A Dutch child in school has little time for play. In the Dutch school equivalent to the American high school, students must study the English, French, German, Greek, and Latin languages, besides science, history, and mathematics.

Dutch universities at Leyden, Utrecht, Groningen, and Amsterdam, have been famous since the 17th century. The Royal Polytechnic School is at Delft.

Memorials of the Past

Almost everywhere in Holland, the past is as much with you as the present. There are great Gothic or Renaissance cathedrals, almost always white-washed, to conform to the Protestant religion for which they are now used. You also find many old town halls and weigh-houses where for hundreds of years the cheeses have been weighed. You will not see many ruins, though, for the Dutch are so orderly that they either tear them down or rebuild them for present-day use.

The art galleries of even some of the smaller cities are the envy of many capitals of Europe. Lucas

van Leyden, father of the Dutch school of art, ranked next to the German, Dürer, as an engraver in the 16th century. The Dutch "Golden Age," in the 17th century, gave birth to one of the world's great artists

LEARNING HIS CRAFT EARLY



Boats are such a part of Dutch life that nearly every boy has a toy boat, with which he learns how larger craft are handled.

—Rembrandt, master of light and shadow. Those Dutch artists, with their masterly technique, painted chiefly the scenes of daily life. You may see still in Dutch taverns the bold laughing faces immortalized by Frans Hals; and in many Dutch homes is still the tranquil luminous beauty caught by Ver Meer of Delft, and Pieter de Hooch. The wide horizons, vast cloud spaces, and the pale yellow light of the Dutch landscape are the same today as when Hobbema, Ruysdael, and Cuyp painted them. Nor must one forget the tavern and home canvases of Steen, Dou, Terborch, and Metsu, nor the sturdy cattle of Paul Potter. Israels, sympathetic interpreter

of humble folk, and Vincent van Gogh of Brabant, a post-impressionist who painted in vivid colors with brutal force, are Dutch artists of the 19th century.

Dutchmen have made history in many branches of learning—Erasmus, the great Renaissance humanist; Grotius, the great jurist; the philosopher, Spinoza; the 17th century doctor, Boerhaave; Coster, considered by some the inventor of printing; Leeuwenhoek, who developed the microscope; and the physicist, Huygens.

Literature written in Dutch is not well known to the outside world, for most of the famous scholars wrote in Latin. Chief among writers in Dutch are Joost van den Vondel, the "Dutch Shakespeare," and Jakob Cats, the moralist, both of the 17th century. The Dutch language is similar to Flemish and is a cousin to modern English and Low German. All three are derived from Old Saxon which in turn comes from the Germanic branch of prehistoric Teuton speech. Dialects vary with the provinces, but without sharp differences.

Holland in History

In the Middle Ages, the present kingdoms of Belgium and the Netherlands were a group of disconnected counties, duchies, and independent cities, some of them forming part of France and some part of the Holy Roman Empire. Gradually these passed into the hands of the Burgundian dukes; and Charles the Bold sought unsuccessfully to weld them together and create of them a border kingdom between France and Germany (see Charles the Bold). The marriage of his daughter, Mary, to Maximilian of Austria brought the Hapsburgs to rule over the "Low Countries"

(Netherlands), as this whole group of territories was then called. On the abdication of the Emperor Charles V in 1555, they passed to Philip II of Spain.

Against the political and religious tyranny of Spain, which reached a climax in the infamous rule of the Duke of Alva and his "Council of Blood," an armed revolt began in 1568. The rebels rallied around William the Silent, Prince of Orange, known as the "father of his country." Rebel sailors, known as "Beggars of the Sea," captured the city of de Brielle, which con-

trolled the Maas, and Flushing, at the mouth of the Scheldt. But the ten southern provinces were Catholic, while the seven northern ones were Protestant, so strife crept in. In 1579 the Protestant provinces formed the separate Union of Utrecht, which marked the beginning of the Dutch Republic, and thenceforth were usually called the United Provinces, or Dutch

Netherlands. The southern provinces, which came to be called the Belgian or Spanish Netherlands, remained under Spain (see Belgium). The Dutch Netherlands in 1581 issued their formal declaration of independence from Spain. In 1609, Spain signed a truce, virtually acknowledging the independence of the republic after a desperate struggle led by the statesman Oldenbarneveldt and by able Maurice of Nassau, William's son. Formal peace did not come until the Treaty of Westphalia (1648).

The "Golden Age"

With the first half of the 17th century came the "Golden Age" in Holland. The United Provinces were the foremost commercial and sea power in the world. The power of Spain was ebbing fast. Wars in Germany and France kept these two countries from rivaling the Dutch Netherlands in art and trade, while England had not yet begun its career as a manufacturing nation. Thus, fortunate circumstances as well as the natural advantages Holland still has—rich soil, waterways, ports, nearness to wealthy parts of Europe—made Dutch

supremacy in the glorious 17th century.

Before long, the rich colonies and heavy trade of the Dutch aroused jealousies. England and the United Provinces fought at sea in 1652–54 and again in 1665–67, during which Admiral De Ruyter terrified London by burning the British fleet on the Medway, a tributary of the Thames. Louis XIV of France (in 1672–78 and 1689–97) failed to conquer the Netherlands (see Louis, Kings of France). William III of Orange in 1689 became king of England (see William,

THE STORY OF 'HANS AND THE DIKE'

If some frightful disaster should suddenly destroy all the dikes of Holland, at least half of the country would be wiped off the map. The dikes mean more to the Dutch than anything else in the world. Dutch history and legend therefore abound in stories like the following tale of 'Hans and the Dike'.

HANS was a boy of Haarlem with the yellow hair, the blue eyes, the red cheeks, and the big pantaloons that one always expects any Dutch boy to have. One Saturday morning, he went hiking into the country with his brother Dieting, who was two sizes smaller than Hans. Hans got tired and climbed up on top of a dike to rest, but Dieting kept on playing with his ball.

Suddenly Dieting shouted, "See the water coming through the dike. It bubbles."

"Where? Where?" cried Hans.

"Here," answered Dieting.

And sure enough, water was trickling through a little hole in the dike. Hans was old enough to know that a little hole would in no time at all become a big hole. And through the big hole, the hungry sea would come rushing on to the land.

"Run, Dieting. Run as fast as you can to Haarlem and bring father and the neighbors to fix the dike. I will stay here on guard."

Dieting was soon out of sight, and Hans was alone. The water started to come faster. Hans tried to plug the hole with grass, but that soon washed out. He stuck his forefinger in the hole, and it just fitted. The icy water numbed his finger, but he held it in the hole. His arm was cramped. The sun blazed down on the meadow. Hans had never in his life been so miserable. "Will father never come?" he thought.

Just then he heard shouts. His father and a crowd of men ran towards him with shovels. They pulled his poor swollen finger from the dike and rubbed his aching arm. After they had piled mud and stones over the hole, they carried him back to town in triumph on their shoulders. Hans was a hero in Haarlem that day and for many days thereafter.

Kings of England). The War of the Spanish Succession further exhausted Dutch strength (*see* Marlborough, First Duke of). The Netherlands never again became a leading power. The aristocratic republic definitely ended and the office of "stadholder," or governor, became hereditary in the house of Orange in 1747.

When the wars of the French Revolution broke out, the French revolutionaries overthrew the rule of the house of Orange and made the Netherlands again a republic (1797). Napoleon set his brother Louis over it as king (1806-10), but later felt obliged to annex the land directly to France. The Congress of Vienna restored the Netherlands as a kingdom under the house of Orange and added to it the southern provinces (Belgium) in an ill-mated union. Belgium revolted in 1830 and set up a separate kingdom.

King William III ruled from 1849 to 1890. He was succeeded by his daughter, Wilhelmina. Queen Wilhelmina's only child, Crown Princess Juliana, married the German Prince Bernhard zu Lippe-Biesterfeld in 1937.

The Netherlands in Two Wars

In the World War of 1914-1918, the Netherlands suffered severely from loss of commerce but succeeded in remaining outside the conflict. In the European war which began in 1939, the Dutch were not so fortunate. On May 10, 1940, Germany invaded Holland, along with Belgium and Luxemburg. The Dutch fought bravely, but they were quickly downed by superior German forces. On May 13 Queen Wilhelmina fled to London and the following day the Dutch army surrendered. Holland thus fell under the

A BIT OF OLD HOLLAND



In the old Zuider Zee region, where one of the great engineering projects of modern times goes forward, the leisurely Dutch windmill offers a sharp contrast between the old and the new.

rule of a German army of occupation, but Dutch overseas possessions remained loyal to the Queen's "exile government" in London. (*See also* World War, Second; Netherlands in FACT-INDEX at the end of this volume.)

How the Ocean Saved Leyden from the Spaniards

LONG, long ago—more than 300 years, in fact—grim fierce Spanish soldiers were besieging the quaint Dutch city of Leyden.

For days and weeks and months they had surrounded the city. The people within were starving. All day and all night the babies cried for food, but there was no bread left in the city. Hans and Gretchen sacrificed their pet dogs to feed the people. The leaves were all picked from the trees and eaten. But still the people would not surrender to the Spaniards, who were seeking to restore the hateful rule of the Spanish king.

Then one day carrier pigeons flew in to the besieged city. On their legs were found messages from the brave leader of the Dutch, William of Orange, saying that the dikes which held back the ocean had been cut and the ocean was coming to drown out the besiegers. Oh, how the people rejoiced! They fired cannon and beat drums to show their joy.

Spaniards Laugh at the Plan

When the Spanish commander learned that the dikes had been cut he was afraid. But his officers laughed at his fears. "William of Orange may rule the hearts of his countrymen," they said, "but he cannot rule the ocean as well. No one but a crazy man would think it possible to call the sea from its

bed and march it across 22 miles of level land to the walls of an inland city."

In the center of Leyden, on its highest point, stood a tower. Many times a day the people climbed to the top of this tower, straining their weary eyes seaward to discover the ocean coming to their help. They could not see it, and hope grew faint as day after day wore away and no one outside Leyden seemed to remember them.

The Promise to Save Leyden

At the end of August the pigeons carried to their brave leader, William of Orange, a message of despair from Leyden. "We have surely been forgotten," they wrote. "If help does not come soon, we must all perish." Back came the cheering answer, "Rather will we as a whole land and all our possessions perish in the waves than forsake thee, O Leyden."

And it was true. The Dutch were busy collecting ships and supplies to help the suffering people. At last all was ready and the fleet set sail. Over the new sea made by cutting the dikes the ships sailed until they were only five miles from the city. But here they were stopped. The water was too shallow for the ships. The wind was against them, too, for it blew steadily from the east and drove the water back toward the ocean instead of blowing it inland.

In Leyden things were at their worst. The people knew that their fate depended on the wind. Their eager eyes were fastened on the weather-vane and earnest prayers were sent up that the wind might change. But still the vane pointed obstinately to the east. If help did not come soon it would be too late. Scores were dying every day. Rats and mice had grown to be delicacies.

The Spaniards threw their taunts into the city—"As soon expect the Prince of Orange to pluck the stars from the sky as to bring the ocean to the walls of Leyden." Immediately the brave men of Leyden sent back the bitter retort, "Ye call us dog-eaters, and it is true. So long then, as ye hear dog bark or cat mew within the city, ye may know that the city holds out."

Then from the northwest came a wind which freshened to a gale, veering around to the southwest. The waters of the North Sea were driven and thrown madly landward, and poured through the gap cut in the dikes.

In a few hours the water about the rescuing vessels had deepened. On the fleet sailed, through the branches of drowned orchards and the chimneys of buried cottages. It was midnight, pitchy black, and with the storm howling on every side. Somewhere in this blackness the Spaniards were fleeing before an enemy that they could not fight. Many were caught by the advancing waves. In Leyden there was no sleep that night, and early the next morning all were out to see the fleet sail up to the city walls. The starving people rushed to the wharves, snatching the bread thrown them from the vessels. It was the first wholesome food they had tasted in two months.

The burst of welcome over, everyone fell into solemn procession and turned toward the great church to thank God for his wonderful deliverance. As a reward for the city's courage, William of Orange offered its brave people their choice of a grant for a university or an exemption from taxes. They chose the former, and the university stands today as a monument to their bravery.

—REFERENCE-OUTLINE for Study of NETHERLANDS and BELGIUM—

THEIR strategic but dangerous position between great rival nations and their favorable situation for commerce have been the chief factors in the stories of these two little nations. In Holland, with its scarcity of minerals, the characteristic industries are agriculture, dairying, and the raising of flower bulbs. Belgium, on the other hand, with abundant iron, coal, and sand, is sometimes called the "workshop of Europe" because of its many factories, though 60 per cent of the land is intensively farmed. Both countries have a remarkably large commerce.

I. THE NETHERLANDS:

- A. Physiography: N-66, E-321. Dikes and Canals N-66, N-69, N-70 pictures, N-71 picture, E-319 picture; Reclamation I-147, I-150 picture, N-71 picture; Rivers—Rhine R-93; Meuse (Maas) M-131; Scheldt S-38.
- B. Climate: N-70.
- C. The People and Their Customs: N-66, N-67 pictures, N-68 picture, N-69, N-70.
- D. Chief Industries: N-66. Dairying N-68; Tulip Raising T-149, N-68, N-69 picture; Manufacturing N-68, A-189, R-159, U-266; Fisheries N-68; Diamond Cutting A-189.
- E. Commerce and Transportation: Imports and Exports N-66, N-68; Canals, Rivers, Railroads N-66, N-70, C-68; Ships S-129; Colonial Trade N-66, J-205, E-142.
- F. Chief Cities: N-68-9. Amsterdam (capital) A-189; Rotterdam R-159; The Hague H-194; Utrecht U-266.
- G. Colonies: East Indies E-142; Java J-203; Borneo B-196; Sumatra S-325; Celebes C-121; New Guinea N-85; Dutch Guiana G-182; Curaçao (Fact-Index).
- H. Modern Education: N-71.
- I. Art, Learning, and Language: N-71-2.
 - a. Painters: N-71, P-16-21. Rembrandt R-72; Hals H-202.
 - b. Pottery: P-332, P-335 picture.
 - c. Scholars and Scientists: N-72. Erasmus R-65, R-74, R-159, R-75 picture; Coster P-347; Leeuwenhoek M-156; Huygens L-128.
- J. High Lights in Netherlands History: N-72-3.
 - a. The "Low Countries" in the Middle Ages: N-72. Ambitions of Charles the Bold C-153; Ruled by Charles V C-146, E-323; Philip II of Spain P-163.
 - b. The Reformation: R-65.
 - c. Struggle for Independence Under William of Orange W-103, U-266, N-72-3. Republic N-72, E-323, T-81.

- d. Holland's Spice Monopoly Broken: S-249.
- e. Naval Power in the 17th Century: N-72.
- f. Wars with England: N-72, B-155, E-271 picture, C-150; Wars with Louis XIV of France: L-201, W-103.
- g. Louis Bonaparte's Brief Reign: B-171, N-73.
- h. South African Colonies Lost: S-199, S-200.
- i. Restoration of Kingdom and Brief Union with Belgium: N-73, B-90, B-254, E-324.
- j. Rule of Queen Wilhelmina: N-73.
- k. Conquered by Germany in 1940: N-73.

II. BELGIUM:

- A. Physiography: B-86, B-87 map, B-90. Scheldt River S-38; Meuse River M-131.
- B. Resources and Industries: Minerals B-88, B-90; Manufacturing B-88, B-90; Agriculture B-86; Fisheries B-88; Commerce B-87, B-88, B-90, M-131, A-224.
- C. The People and the Language: B-86, B-88, B-90.
- D. Chief Cities: B-86-8. Brussels (capital) B-254; Antwerp A-224, B-89 picture; Liège L-123; Ghent G-84; Bruges B-252, B-88 picture; Ostend B-88; Louvain L-209; Ypres Y-209.
- E. Flemish Painters: P-16-21. Rubens R-170; Van Dyck V-272.
- F. High Lights in the History of Belgium: B-90.
 - a. Battleground Since Roman Conquest: B-86, L-123.
 - b. Belgium in the Middle Ages:
 1. Commercial Supremacy of Flanders Cities B-87, B-252, B-253 picture, B-254, T-10.
 2. Charles the Bold and the Revolt of Liège C-153.
 3. Hapsburg Possession: C-146, P-163.
 4. Revolt Against Spain: B-90, N-72, W-103, B-254.
 - c. In French Possession: B-90. Claims of Louis XIV L-201; Occupied in the Revolution F-202; Napoleon Obtains Belgium by Treaty N-7, A-224.
 - d. Brief Union with Holland and Separate Kingdom Established (1830): N-73, B-90, B-254, E-324.
 - e. The Congo Free State: C-331, B-90, A-42.
 - f. Belgium in the World War of 1914-1918: W-151-2, W-154, W-160-1, W-164, B-90.
 1. Neutrality Violated W-151-2.
 2. Invasion and Siege of Liège W-154, L-123.
 3. Brussels and Antwerp Occupied W-154, A-224, B-254.
 4. Ostend, Bruges, and Zeebrugge Captured W-154, B-254.

5. Battles of Ypres Y-209, W-154, W-157.
6. Devastation Wrought by Germans, B-90, L-209.
7. Famous Figures of the War—King Albert I A-109; Cardinal Mercier M-119.
8. Belgian Gains in Peace Treaty W-173, C-332.
- g. Rule of King Leopold III: A-109, B-90.
- h. Belgium Again Invaded and Conquered by Germany in 1940: B-86, B-90.

Bibliography on Netherlands and Belgium

—Books for Younger Readers:

- Bemelmans, Ludwig. *Golden Basket* (Viking, 1936).
 Cammaerts, Emile and Tita. *Boy of Bruges* (Dutton, 1918).
 Carpenter, Frances. *Our Little Friends of the Netherlands, Dirk and Dientje* (Am. Book Co., 1935).
 Daniel, Hawthorne. *Broken Dykes* (Macmillan, 1934).
 DeGroot, Cornelia. *When I Was a Girl in Holland* (Lothrop, 1917).
 De Jong, Meindert. *Dirk's Dog, Bello* (Harper, 1939).
 DeLeeuw, A. L. *Dina and Betsy* (Macmillan, 1940).
 Dodge, M. M. *Hans Brinker* (Scribner).
 Griffis, W. E. *Brave Little Holland* (Houghton, 1931).
 Hichtom, Ninke van. *Afke's Ten* (Lippincott, 1936).
 Jonckheere, Robert. *When I Was a Boy in Belgium* (Lothrop, 1915).
 Olcott, Virginia. *Klaas and Jansje* (Silver, 1933).
 Peck, A. M. *Belgium* (Harper, 1940).
 Perkins, L. F. *Dutch Twins* (Houghton, 1911).
 Potter, Edna. *Land from the Sea* (Longmans, 1939).
 Smith, M. E. E. *Holland Stories* (Rand, 1932).

- Van der Heide, Dirk. *My Sister and I* (Harcourt, 1941).
 Van Stockum, Hilda. *A Day on Skates* (Harper, 1934).

—Books for Advanced Students and Teachers:

- Anderson, I. W. *Spell of Belgium* (Page, 1934).
 Andrews, C. E. A. *Belgium* (Methuen, 1932).
 Barnouw, A. J. *The Dutch* (Col. Univ. Press, 1940).
 Cammaerts, Emile. *Albert of Belgium* (Macmillan, 1935).
 Capek, Karel. *Letters from Holland* (Putnam, 1933).
 Clark, S. A. *Many-colored Belgium* (McBride, 1931).
 Clark, S. A. *Holland on \$50* (McBride, 1936).
 DeLeeuw, A. L. *The Flavor of Holland* (Century, 1928).
 DeLeeuw, Hendrik. *Crossroads of the Zuider Zee* (Lippincott, 1938).
 Essen, Leon van der. *Short History of Belgium* (Univ. of Chicago Press, 1920).
 Gibson, Hugh. *Belgium* (Doubleday, 1939).
 Linden, Herman van der. *Belgium* (Oxford, 1920).
 Lucas, E. V. *Wanderer in Holland* (Macmillan, 1924).
 Motley, J. P. *History of the United Netherlands* (Harper).
 Motley, J. P. *Rise of the Dutch Republic*, 3v. (Dutton).
 Muirhead, Findlay and L. R., eds. *Holland and the Rhine* (Macmillan, 1933).
 Scheffler, Karl. *Holland* (Knopf, 1932).
 Schoonmaker, Frank. *Come with Me through Belgium and Holland* (McBride, 1928).
 Van Kleffens, E. N. *Juggernaut over Holland* (Col. Univ. Press, 1941).
 Van Loon, H. W. *Fall of the Dutch Republic* (Houghton, 1924).
 Van Loon, H. W. *Indiscreet Itinerary* (Harcourt, 1933).
 Vose, E. N. *Spell of Flanders* (Page, 1915).

AMERICAN NEUTRALITY *and Its* HISTORY

NEUTRALITY POLICY of THE UNITED STATES.
 How can the United States remain neutral while other great nations are at war? This has been a grave American problem from the earliest days of the republic to the present time.

Three years after George Washington became president a fierce war broke out in Europe. France, which had helped the American colonies win independence, was fighting against its neighbors, including England (see French Revolution). France sought to get the new American government to allow its minister, "Citizen" Genêt, to recruit soldiers on American soil and to fit out war vessels in American ports. But Washington saw that the young republic which he had just helped establish might be destroyed if it should be drawn into the long-standing and complicated quarrels of European nations. Therefore he and Jefferson, his secretary of state, drew up in 1793 an extremely important historic document—the first announcement by a government that it proposed to make *neutrality* a definite national policy. In 1794 Congress passed a Neutrality Act to define and enforce neutral behavior on American soil.

The Meaning of Neutrality

This policy meant, in brief, that during a war in which no established American rights were at stake, the United States government undertook to remain friendly with both sides and, so far as possible, to continue to deal impartially with each of the fighting nations (*belligerents*) on the same basis as in time of peace. The use of American territory by either side for recruiting or any other military activity was prohibited. American neutrality was further defined by the Foreign Enlistment Act of 1818 which forbids American citizens from fighting against a nation with which the United States is at peace.

This much of the new American neutrality policy—defining what the United States itself would do and would not do in case of war between other nations—was comparatively easy to carry out, for it did not depend upon foreign approval or agreements. But neutrality meant more than this. It involved certain *neutral rights* and the demand that these be respected by the belligerents. For example, the United States insisted upon the right of American ships to continue their regular peace-time commerce with both sides during a war, subject only to restrictions imposed by international law (see Blockade; International Law).

This aspect of neutrality as an inflexible national policy created graver problems. Many controversies grew out of it; and twice—in 1812 and 1917—the United States went to war to defend its neutral rights.

Old Ideas About Neutrality

In ancient times, when warfare was considered one of the noblest activities in which a people could engage, a nation which undertook to remain neutral when its neighbors were fighting did so at its own risk. Both sides regarded the neutral nation as a probable enemy waiting to take advantage of the quarrel, and in general this suspicion was well founded. There was in those days no thought of the rights or the obligations of neutrals.

During the Middle Ages, when the nations of modern Europe were taking shape and when the coöperation of those nations in the Crusades had suggested the idea of an international code of conduct, scholars and lawyers began to formulate the rules and principles that make up what we call international law. They dealt among other things with the question of the freedom of the seas. By the provisions of the *Consolato del Mare* (Consulship of the Sea), which dates back to the 14th century, warring nations were forbidden to

seize the merchandise of neutral nations aboard ships in the Mediterranean. In 1625, Hugo Grotius, the "father of international law," wrote his famous book 'Concerning the Law of War and Peace' (*De Jure Belli ac Pacis*). In this book he said that neutrals should "do nothing whereby he who supports a wicked cause may be rendered more powerful, or whereby the movements of him who wages a just war may be hampered." This doctrine implied that a neutral nation must decide at the outbreak of war which side is right and which is wrong, and shape its course accordingly. This helped to weaken the principle of neutrality throughout Europe, since a nation which obeyed this doctrine would not remain strictly impartial.

Development of the American Policy

The American neutrality policy begun by Washington concerned itself solely with the rights and interests of the United States. It definitely prohibited taking sides in a foreign war, regardless of whether popular sympathy was with one side or the other. This issue came sharply to the fore when bitter partisanship over the French-English wars divided the American people. Jefferson was the leader of those who favored the French cause, and Hamilton the leader of the pro-British party (see Jefferson, Thomas). Yet Jefferson, as secretary of state, strictly followed Washington's neutrality policy when he put an end to French attempts to involve the United States in acts hostile to England.

The same wars later brought about a situation that illustrated the difficulty of enforcing neutral rights by peaceful methods. While Jefferson was president, both the French and the English interfered with American ships on the high seas. In an effort to treat the offenders impartially, Jefferson in 1807 procured the passage by Congress of the Embargo Act, forbidding all American ships to leave port. By cutting off both England and France from supplies, Jefferson hoped to force respect of American rights. But the act nearly wrecked American commerce, without doing much harm to the fighting nations, and it had to be repealed (see Embargo Acts). Five years later, when England, by this time in secure mastery of the Atlantic, was interfering more and more with American ships and violating other American rights, President Madison declared war (see War of 1812).

The treaty of peace of 1814 made no mention of neutral rights, but the United States continued to hold steadfastly to its policy. The Monroe Doctrine, warning Old World nations against attempting to establish any more colonies in the New World or to interfere in the affairs of New World nations, was dictated by the desire to safeguard American neutrality (see Monroe Doctrine).

The Principle of Neutrality Gains Ground

For a century after the Napoleonic wars there was no prolonged general war like those of the preceding centuries; and there was no impressive case in which a neutral was driven to the verge of war to defend its rights. Wars were commonly brief and decisive. Some

of the most important nations always remained at peace; and these, almost without exception, guided their action as neutrals by following the policy of the United States. Thus through the century they helped to build up the principles of neutrality.

During the American Civil War, the United States had to face the problem of neutrality from the other side of the fence. Being itself at war, it was concerned with the neutrality policies of another nation. England had announced its neutrality; but England permitted the Confederacy to have a warship, the *Alabama*, built in an English shipyard, and then permitted the *Alabama* to sail out to attack shipping under the United States flag. The United States, on the other hand, violated an English neutral right when an American warship removed two Confederate representatives from an English passenger ship, the *Trent*. Once again rights and duties of neutrals and belligerents almost drew a neutral nation, this time England, into war; but the cool heads of President Lincoln and British statesmen preserved peace (see 'Alabama' Claims; 'Trent' Affair).

By 1914 it was easy to believe that peace was the normal condition of the world, and war the exception; that every rule ought to be interpreted in the interest of the nations at peace; and that in every case of dispute over the rights of neutrals the burden of proof ought to be put upon the belligerent nation. The United States, as uniformly neutral in European wars, became the chief interpreter of the neutral doctrine. Many Americans came to believe that the next step for the world would be a permanent international organization of the nations for the purpose of preventing war.

Neutrality and the First World War

The United States kept to its policy during the early years of the World War from 1914 to 1917. It proclaimed its neutrality anew as each of the European nations was drawn in. But before long, both the Allies and the Central Powers were arguing that the changed conditions of modern warfare compelled them to alter their attitude toward neutral rights. President Wilson replied that no belligerent could alter a rule after the war began, and that the long-established principles of neutrality forced the United States to insist that the pre-war rules be respected. Then he discovered, as Washington, Jefferson, and Madison before him had discovered, how unwilling belligerents always are to make any concession concerning the rights of neutrals. He finally reached the conclusion that the position of a neutral country in a great war had become unbearable, and that neutrality as a national policy could no longer be relied on to keep the United States at peace.

American neutrality had been violated by both sides, but the offenses of the Allies had hurt only American property, while those of Germany had cost the lives of American citizens (see World War of 1914-18). This dictated the American choice of sides, so far as international law was concerned.

When President Wilson at last declared war on Germany in 1917, one of his motives was a desire to make that war the last. For the future he hoped to bring about such a combination of powers in favor of peace as would make the whole question of neutrality obsolete. To this end, at Paris in 1919, Wilson drove the Allies to include a League of Nations in the Treaty of Versailles (*see* League of Nations).

The United States, however, did not enter the League. It takes a two-thirds vote in the Senate to conclude a treaty, and two-thirds of the senators could not be induced to commit the country to membership in the League, except with certain far-reaching reservations which it was believed the other nations would not accept. There was fear that the United States, if it entered the League, would lose some of its freedom of action. In future quarrels between nations the League proposed to decide which side was right and it undertook to bind its members to fight for that side, if necessary. The American people did not want their government to be forced to take sides in complicated European quarrels. They came to regard the League as one of those "entangling alliances" against which Washington had warned his countrymen.

Return to Traditional Policy

In the presidential election of 1920, when the League was one of the major issues, American voters rejected by a large majority the Democratic pro-League candidate. This was a vote for a return to the traditional American neutrality policy.

This decision did not mean, however, that the American people became indifferent to foreign quarrels. The history of the World War had shown them how easily small quarrels could lead to big ones involving all great nations. The United States took active part in international peace movements, such as the Kellogg-Briand Pact for the Renunciation of War and agreements among the great nations to limit their armaments (*see* Peace Movement). But the peace movements did not seem likely to bear fruit rapidly enough to avoid occasions of war in the near future.

The League of Nations proved unable to stop aggressions of strong nations upon the weak. The Kellogg Pact, renouncing war as an instrument of national policy, was ineffective, since every country that goes to war convinces itself that it is acting only in self-defense. Japan extended its penetration into China; Italy overran and annexed Ethiopia; and the dictatorial régimes in Russia and Germany threatened the security of Europe. It seemed improbable that the World War of 1914-18 had ended war, and the United States was obliged to reconsider its attitude as a neutral in the event of another general conflict.

Modification of Neutrality Policy

Strict insistence on American neutrality policy and the right of neutrals to continue trade had caused much trouble during the World War of 1914-18, and had contributed toward drawing the United States into that war. Wartime trade with belligerent nations can seldom be impartial. A blockade may keep

American exports from one side, whereupon the other side, rightly or wrongly, may accuse the United States of helping its enemy.

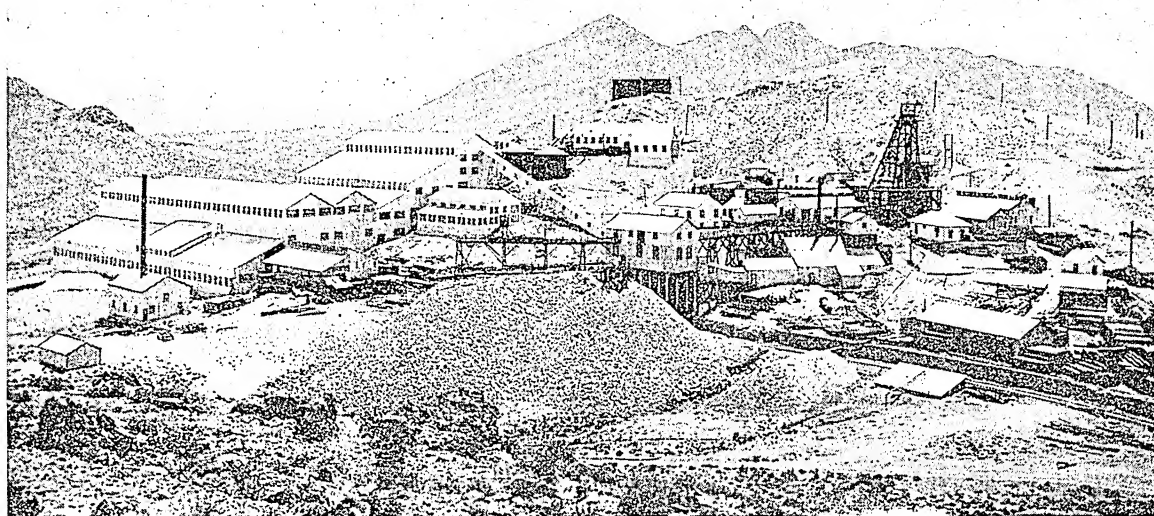
The United States, therefore, decided to modify its policy and impose certain restrictions on wartime trade. In 1935 and 1936 Congress passed laws prohibiting the export of arms, ammunition, and implements of war to warring nations. Under these laws, embargoes on arms were applied in the Italian-Ethiopian war and in the Spanish civil war. The Neutrality, or Peace, Act of 1937 went farther. It prohibited loans and credit to warring nations and forbade Americans to travel on the merchant ships of belligerents. A temporary section empowered the president to name certain articles other than munitions which Americans were forbidden to export to belligerents except on a "cash and carry" basis—that is, goods must be paid for before shipment and transported on foreign vessels. Though President Roosevelt signed the resolution, he and many other leaders were dissatisfied with it—particularly with the embargo feature—and there was agitation for revision.

When a major European war broke out in 1939, the chief concern of the nation was to maintain its neutrality. The President immediately invoked the Neutrality Act, but called a special session of Congress for September 21 to consider revising it. Two main arguments were put forth in the long and heated debate on the arms embargo issue. The revisionists, who included a majority of the Democrats and many Republican leaders, declared that the embargo was unneutral because, by denying war supplies to Great Britain and France, the act favored Germany. The "isolationists" argued that export of war supplies would be unneutral since it would benefit only the Allies, whose blockade would prevent American exports from reaching Germany. A new Neutrality Act, replacing the earlier acts, was passed on November 3.

The Neutrality Act of 1939

This act contained no arms embargo provision but put all trade with warring nations on a "cash and carry" basis by forbidding the export of any goods to belligerents until some foreign government or agency had taken title to them. It forbade granting credit or making loans to belligerent nations or their agents. It forbade transportation of passengers and goods to ports of belligerent nations on American vessels; it authorized the president to designate other combat areas into which American ships and citizens could not go. It prohibited American citizens from traveling on belligerent ships, except under rules issued by the president. It restricted arming of American merchant vessels. Contributions in behalf of belligerent nations could not be solicited in the United States except funds by nongovernmental organizations for relief of human suffering. Authority was given the president to regulate the use of American ports and territorial waters by foreign submarines and armed merchant vessels. The National Munitions Control Board, headed by the secretary of state, licensed and regulated trade in munitions. The "Lend-Lease" Act of March 11, 1941, superseded some of these provisions by empowering the president to transfer war materials to any nation whose defense he deemed vital to American defense. When Japan's attack on Pearl Harbor in December 1941 brought the United States into war, the Neutrality Act of 1939 became nonoperative. (*See also* Roosevelt, Franklin Delano.)

RUGGED NEVADA, RICH *in* TREASURE



One of the Great Silver Mines at Tonopah Which Has Poured Out Treasure Since 1902

NEVADA. A land of rugged beauty is Nevada, the sixth largest state in the Union. But much of this beauty is created by majestic chains of mountains, the play of light over arid salt deserts, the brilliant colors of bare rock and creamy sand dunes. So despite its size Nevada has the least population of all the states.

Mountains and Basins

Most of the "Sagebrush State" lies in the Great Basin of western United States. This is a giant mountain-ribbed depression whose rivers have no outlet to the sea. Only the northeastern corner in the Snake River Valley and the southeastern corner in the Colorado River Valley drain to the Pacific.

The lofty Sierra Nevada flanks the western border. The rest of the state is broken by a series of parallel mountain ridges running from north to south, with desert or semidesert valleys between them. The many snow-covered peaks gave the state its name, which in Spanish means "snowy." Vegetation is sparse, but the earth itself shows all the colors of the spectrum. Such names as Opal, Rainbow, Ruby, and Blue mountains tell their own story.

Some of the inter-mountain basins contain salt lakes. Others are great salt-encrusted depressions known as "sinks" in which the inflowing streams disappear. Along the few rivers are meadows which provide pasturage for live stock. These meadows and the less arid basins are ablaze in the spring with the blossoms of creosote, cactus, sagebrush, wild iris, wild peach, and many other mountain plants. Pyramid, Winnemucca, Carson, and Walker lakes, in the west,

Extent.—North to south, 472 miles; east to west, 321 miles. Area, 110,540 square miles. Population (1940 census), 110,247.

Natural Features.—Many mountain ranges from 7,000 to 10,000 feet in height, running generally from north to south; highest point, Boundary Peak (13,145 feet) on the southwest border; lowest point, Colorado River (470 feet). Humboldt River in northern part of the state, flowing into Humboldt Lake; Carson, Truckee, Colorado. Lakes Pyramid, Tahoe (on California border), Walker, and Carson (in west), Ruby and Franklin (in east), Mead (in southeast). Mean annual temperature, 50°; mean annual precipitation, 9".

Products.—Copper, silver, gold, lead; live stock; wool; hay.

Cities.—Reno (21,317), Las Vegas (8,422), Carson City (capital, 2,478).

are remnants of prehistoric Lake Lahontan, which once covered more than 8,000 square miles. Most of Lake Mead, created by Boulder Dam on the Colorado River, is in Nevada. The longest river is the Humboldt.

The Sierra Nevada causes the dry climate by cutting off the rain-bearing winds from the Pacific. The average annual rainfall is only about nine inches. The western border, at the base of the Sierra Nevada, receives the greatest moisture, most of it in the form of snow during the winter months.

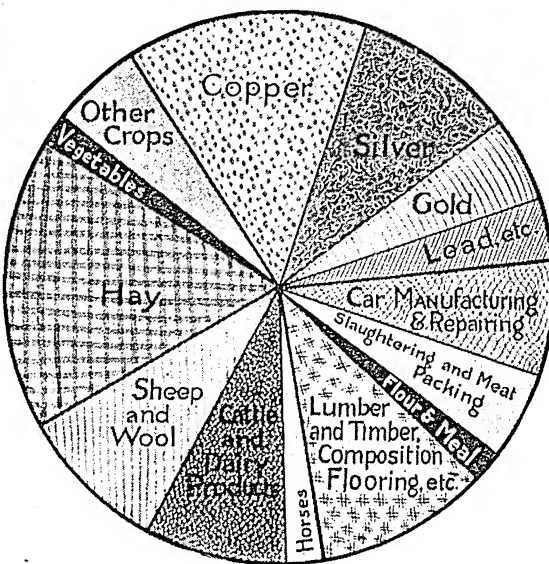
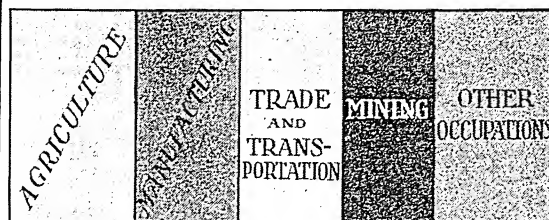
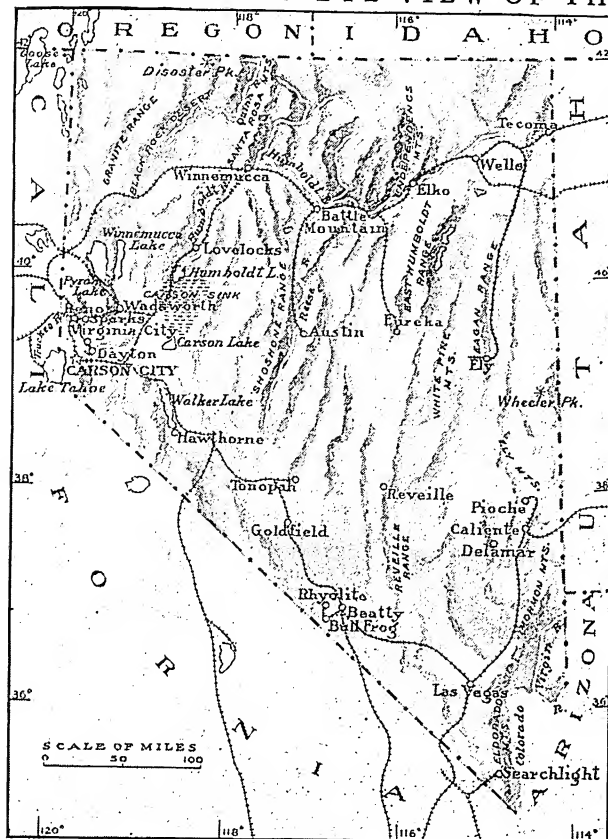
Agriculture and Irrigation

The United States government holds nearly three-fourths of all Nevada in national forests, grazing lands, and game preserves. Only one-seventh of the area is privately owned. Cattle and sheep raising is the principal industry.

Such crops as are raised depend on irrigation. Nevada shares in the waters impounded by Boulder Dam, but there is little fertile land in the southeast. The largest projects are in the west, which is fairly well supplied by the melting snows. The Newlands Reclamation Project, around Carson City, uses the waters of the Truckee and Carson rivers, impounded in the Lahontan Reservoir. The Rye Patch Dam, near Lovelock, retains the flood waters of the Humboldt River. The Walker River Valley is also irrigated. Alfalfa, wheat, dairy products, fruits, and vegetables are produced in these regions.

Many bird and game refuges have been set aside for the protection of wild life. Forests are not extensive, but fir, spruce, hemlock, and pine grow tall and

A BIRD'S-EYE VIEW OF THE "SAGEBRUSH STATE"



Nevada's crumpled surface and lack of rain will prevent its ever becoming a great farming state. Its herds of cattle and sheep, however, supply nearly as great a proportion of its wealth as do the copper, silver, and gold mines. A glance at the round graph at the right will show you the relative value of the state's products. The divided bar above shows the relative number of persons in the chief occupations. The climate of Nevada, while extremely dry, is healthful and invigorating and the scenery is unsurpassed.

green on the higher slopes of the Nevada mountains, and mountain mahogany, willow, beech, cottonwood, wild cherry, and dwarf cedar cover the foothills. Some of these mountains and the clear blue lakes among them, especially Lake Tahoe, which lies partly in Nevada and partly in California, are very lovely and attract throngs of tourists.

Industries and Cities

Most of the state's wealth is dug out of the mountains. The Comstock Lode is one of the most famous of the world's treasure stores. It was discovered in 1859, and to it Virginia City chiefly owes its growth. In its heyday it yielded as much as \$10,000,000 worth of gold annually, and in all it has produced more than \$400,000,000 worth. Its silver has been even more valuable. It is said that the output of this and other Nevada mines was an important factor in maintaining the financial stability of the North during the Civil War. In the first two decades of the 20th century the gold mines at Goldfield and the silver mines at Tonopah were enormously productive. Copper in the Ely district is now the most valuable mineral.

During the second World War, Nevada's deposits of magnesium and manganese helped to make the United States independent of foreign supplies of these stra-

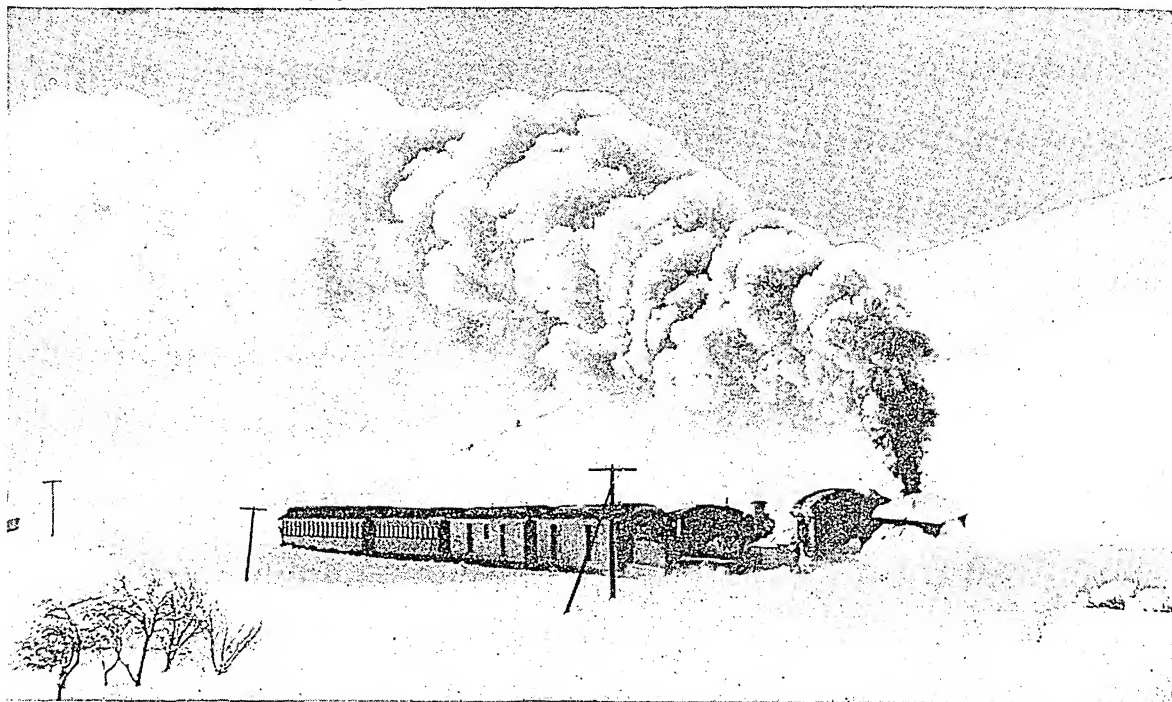
tegic minerals. Undeveloped until the war need arose, the mines were first opened in 1941. Reduction plants near Las Vegas use power generated at Boulder Dam. Other important minerals include lead, zinc, gypsum, mercury, sulphur, tungsten, building stone, and semi-precious gems.

Metal refining is the chief industry. About 90 per cent of the ore mined is refined in the state, but the metal is shipped elsewhere for manufacturing. Other industrial plants include a few dairies, lumber and planing mills, beet-sugar and flour mills, meat-packing plants, and a railroad repair shop.

Reno, in the western part of the state, is the largest city and the chief distribution, banking, and shopping center. It is the seat of the state university. Las Vegas, the second city, in the southeastern corner, is a great tourist resort, since it is near Boulder Dam and Lake Mead. Elko is the "cattle capital" of the state. Cattle are rounded up over an area of some thousand square miles and shipped from Elko on the hoof. Carson City is the capital.

The Indians of Nevada number about 5,000. They belong to the Piute, Shoshone, and other tribes of the old Shoshonean stock. Pyramid Lake, Duck Valley, and Walker Lake are the largest Indian reservations.

BUCKING THE SNOWS IN NEVADA



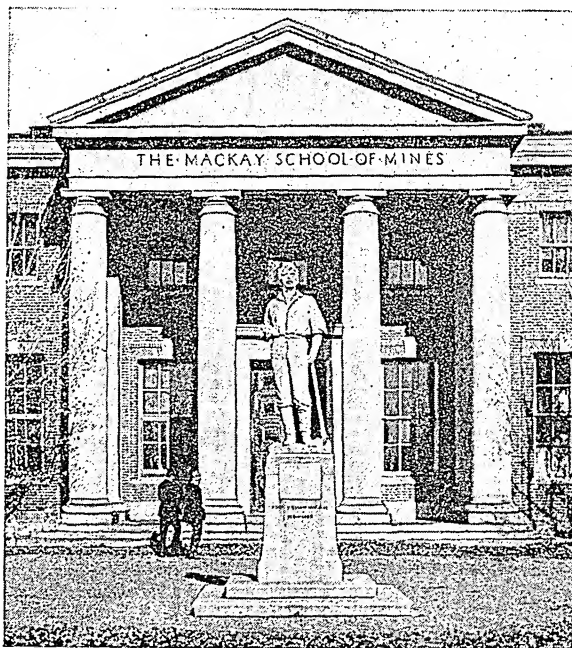
Here you see one of the exciting moments of a winter railway trip over the Nevada Mountains. This train on the Virginia and Truckee Railway has an extra engine equipped with a snow plow to help it get through the drifts along the right of way.

Nevada was part of the territory acquired from Mexico in 1848, at the close of the Mexican War. The first white man to cross its area is believed to have been Francisco Garcés, a Franciscan friar, in 1775. Certainly Peter Skene Ogden, the vigorous old trapper of the Northwest, wandered across Nevada in 1825, and in 1826 Jedediah Smith went pioneering across the state. Not until 1849 was a permanent settlement made, when a trading post was established by the Mormons near the present village of Genoa.

In 1850 much of Nevada was included in the new territory of Utah. With the discovery of the Comstock Lode, in 1859, began the rush to the mines.

Placer mining in California had given out, and by 1860 miners and their caravans of outfits crowded the trails leading to

THE MACKAY SCHOOL OF MINES



John W. Mackay came to New York a poor Irish boy and was always proud of the fact that he began his career in the West, where he made his fortune as a common miner. So in this statue of him, which stands in front of the School of Mines given to the University of Nevada as a memorial by his widow and son, he is represented with his miner's pick.

the Carson River valley. The adventures of Aladdin and the Count of Monte Cristo faded into humdrum insignificance beside the changeable fortunes of Nevada fortune-hunters. "Lucky Baldwin," turned out of his room one Saturday because he could not pay his rent, was a millionaire the next Saturday. After 1877, however, the Comstock lode began to give out and mining declined until revived by the discovery of new fields at Tonopah, Goldfield, and other places in 1906 and after.

Nevada was admitted to the Union as a state in 1864, the deciding reason which impelled President Lincoln and Congress to confer statehood on this scantily populated region being the need of another loyal state to make certain the passage of the 13th and 14th amendments to the Constitution.

The Dream of Chief Winnemucka

LESS than a hundred years ago, the only inhabitants of what is now the state of Nevada were a few tribes of Indians. Among these was a tribe of Piute Indians who lived on the shores of Pyramid Lake and along the banks of the Truckee River. They were shut away from the world on all sides by deserts and mountains. Three hundred and fifty years after Columbus found America, they had never seen a white man.

Few animals or food plants could live in that dry country, so the Piutes were very poor. But they had a beautifully sheltered valley for a home. The lake was salty, like a little sea, and 20 miles wide. Thousands of wild ducks nested around it every spring. Truckee River was full of speckled trout. "Truckee" is the Piute word for "all right," and it certainly was as good a little river as could be found anywhere. Grass and roots and bushes grew along its banks; so for a part of the year antelope, jack-rabbits, and the Indian ponies had plenty to eat. By hunting with bows and arrows, and fishing with nets made of wild hemp, the Piutes could just manage most of the time to get enough food and clothing. Some winters they had nothing to eat besides the pine nuts or seeds that they gathered in the thin mountain forests of the region.

The Piutes had a wise, kind old chief. His name was Winnemucka. He told his people to love peace, tell the truth, never to steal from their poor neighbors, and to be kind to children and to the old and helpless. Sometimes he told them of wonderful dreams that he thought came from the Great Spirit who lived in the sky.

Now, while it was burning hot in that country in summer, the winters were cold and stormy. One hard winter the snow lay deep on the mountains, bitter winds blew, and the river was frozen. For weeks the poor Indians shivered in their rude huts and lived on pine nuts. Then spring came suddenly. Soon the grass was green. There were flowers, too. The wild blossoms of the desert were so pretty and sweet smelling that little girl papooses were named for them. Chief Winnemucka had a little granddaughter who was named Tocmeto'ne, or "Flower of the Wild Mint."

Chief Winnemucka Tells His Dream

That year, when their name-flowers blossomed, the little girls made wreaths and necklaces of them, and danced the flower dance. After the dance was over and the flower songs had been sung, Chief Winnemucka called his tribe around him. They all sat in a circle, around a fire, on the ground. Tocmetone sat on her grandfather's lap, while he told a wonderful dream he had had.

"Last night the Great Spirit brought me a beautiful dream. I saw strangers on the mountains. They rode very large ponies. They were clothed all over,

and not in rabbit skin aprons and antelope cloaks, like us. Their eyes were pale, their skins were red and white. They spoke strange words. They had long sticks with which they made thunder and lightning. They were bold brave men. By and by they will come. And they will need our help. They will not know how to find food and water in the dry land. We must welcome our white brothers and see that no harm comes to them."

It was strange, but that very summer a party of white fur traders came from the North. The Shoshone Indians of Idaho had told them of the desert tribes. They rode horses. From a mountain ridge they looked down on the beautiful sea-green sheet of water of Pyramid Lake. Chief Winnemucka saw them at once, for he had been expecting them. With a loud, joyful cry he sprang forward, crying—

"The white brothers of my dream!"

How the White Men's Hearts were Won

He had 20 of the best ponies brought in. The squaws trimmed the manes and tails of the animals with wild flowers and cedar sprigs, to honor the strangers. Then the chief and his handsomest young braves rode up the mountain with shouts of welcome.

The white men did not understand this at all. They thought these wild-looking nearly naked Indians meant to attack them, and so fired their guns. The Indians were startled by the "thunder and lightning sticks," but they did not run. Chief Winnemucka got down from his pony. He laid his bows and arrows on the ground and spread his arms wide in sign of peace.

Still the white men would not trust him. They motioned him to go away. Winnemucka was sad. Then he sent some of his braves to kill an antelope. He laid the game on the ground for a present, and made his camp far away.

Day after day Winnemucka followed the white men. Every evening he left a present of game, where they could see it and come for it. By signs he pointed out trails and water holes and good camping places. At last he won their trust and friendship. When they invited him to sit at their fire and share their food he was happy. He made a feast for his white brothers. He learned a few of their words.

These poor Indians had nothing to sell, so the fur traders did not come back. But a few years later Gen. John C. Fremont, of the United States Army, came with a big party. This famous surveyor and explorer was called "The Pathfinder." He spent years in traveling over the wild trails of the Great West, where few white men had ever journeyed before. When he rode down into the valley of Pyramid Lake he was surprised to have Chief Winnemucka run to him and cry: "Welcome, white brother!"

General Fremont thought so much of Winnemucka that he called him after the Truckee River—"Chief

All Right." He took him across the Sierra Nevada Mountains with his party. The desert Indians had never tried to cross that lofty range, which for hundreds of miles lifts its snow-capped peaks to the clouds. Winnemucka had never dreamed of such a land as the forested slopes, green valleys, and sunny coast of California.

As fast as he could travel Winnemucka went back home. He told his people of the gardens and orchards, the wheatfields, and the pastures with their flocks and herds of cattle. He told them of the workshops and iron tools, and of the schools for children established by the good Fathers of the Spanish Missions. White men and red lived there together, in peace and plenty. No one burned or froze, or starved or went naked, in that wonderland that was like the land of the Great Spirit.

The next year Winnemucka took 30 families of his tribe to California. He put his little granddaughter Tocmetone in a convent school. While the chief herded sheep for the Mission Fathers, Tocmetone learned to be a good Christian. She was the brightest of all the Piute children. She soon learned to cook and sew, and to read Spanish and English. She had pretty clothes, like white girls. By and by the church gave her two names: Sarah Winnemucka. She and her grandfather were proud of that. But he had a new English name for her. It was "Sweetheart."

"Sweetheart," he said, "you have a better mind and heart than your brothers. You must grow up

fast, and learn all you can. So when I go to dwell in the land of the Great Spirit, you can make the speeches, and write the letters to keep peace between the poor Piutes and their white brothers. They fight sometimes, because they do not understand each other. And some white men and some red men are bad and selfish."

So Tocmetone went back to Pyramid Lake with her grandfather. When he died of old age, she was grown up. Many white miners were coming into the country to hunt for gold and silver in the mountains. They shot all the game and seined the little rivers for fish. The poor Indians were in danger of starving. They wanted to go to war; but Princess Tocmetone told them the words of her good grandfather.

There was then a governor of Nevada appointed by the president of the United States, and a fort with soldiers on Lake McDermitt. Whenever there was trouble, the Piute princess rode her pony to the fort. She always told the truth; she kept her tribe in good order; and she had only peace and friendship in her heart for the white men. So she was loved and trusted by everyone. By and by she brought her tribe to live near the fort. The government kept her there as a peacemaker.

When Tocmetone was very old she said that she had never forgotten her wise kind old grandfather's beautiful dream. She had helped the Great Spirit to make it come true, for red men and white men dwelt together in peace.

NEWARK, N. J. Situated only eight miles west of New York City, and connected with it by "tubes" or subways under the Hudson River through which electric trains carry tens of thousands of "commuters" to the metropolis each day, Newark lives under the shadow of its great neighbor. Nevertheless the city has kept a distinct character of its own. Within its borders are several thousand factories, in which more varieties of goods are produced than in any other city of similar size. It is the largest city in New Jersey. The Passaic River, which enters Newark Bay, furnishes an important water route to the ocean, and to a certain extent Newark shares with New York the advantages of the greatest harbor in the world. In the course of the World War, Port Newark Terminal was completed, transforming a formerly useless tidal meadow into a great shipping, shipbuilding, and manufacturing community.

Newark is an old city with an interesting history. A handful of Puritans from Connecticut, under Robert Treat, founded it in 1666, buying from the Indians what is now Essex County for the equivalent of a few hundred dollars. As an honor to their pastor, who came from Newark-on-Trent, in England, the settlement was given its present name, having first been called New Milford. In recent years the city has grown with remarkable swiftness. It is one of the largest jewelry manufacturing centers in the coun-

try, and has a world-wide reputation for leather manufactures, leading in the making of patent leather. Other products are electrical machinery and supplies, celluloid, paints and varnishes, chemicals, furs, pens, tools, clothing, and buttons. Many insurance companies have their headquarters here.

Institutions of higher education include a state normal school, the University of Newark, the New Jersey College of Pharmacy, the Newark College of Engineering, and the Newark Technical School. The Newark Museum is noted for its work with children and its coöperation with the public schools. The famous bronze statue of Lincoln by Gutzon Borglum, facing one of the city squares, shows the President, seated on a bench, in one of the darkest hours of the Civil War. Children have climbed upon the lap of the sad, kindly figure so often that they have worn the knees shiny. Population (1940 census), 429,760.

NEW BEDFORD, MASS. The Massachusetts state capitol once had a codfish for a weather vane. The City Hall of New Bedford in the old days should have mounted a whale, if anything so bulky would do similar service, for all the traditions of New Bedford are connected with the whaling industry. In the public library you will find the largest collection of books on whaling, the finest whaling prints in the world, and in the Bourne Museum you may even see a full-rigged whaling vessel. Indeed, this city was

long the principal whaling port of the world. The industry began as early as the middle of the 18th century and by 1765 wharves and warehouses had been built. Whales were first hunted off the Virginia and Carolina coasts, and later in West Indian and South American waters. After 1791 the whalers regularly rounded Cape Horn into the Pacific. Arctic whaling, in 1848, began a new era of prosperity for the trade, and in 1857 New Bedford had 329 registered whaling ships. Then with the discovery of oil in Pennsylvania, whale oil was no longer widely needed as an illuminant, and the industry waned.

Since the decline of whaling, the city's prosperity has been based on its manufactures, chiefly of fine cotton goods. The cotton mills still employ many thousands of workers, even though many mills were closed in recent years when this industry began to migrate to the Southern states. Other industries include the manufacture of silk and rayon yarns and cloth, tools, silverware, glassware, cordage, paper goods, rubber goods, sheet copper and brass, shoes, clothing, and toys. Fishing and boatbuilding are also important occupations.

New Bedford is on the Acushnet River at the head of Buzzards Bay, 56 miles south of Boston. It was settled in 1652, and incorporated as a city in 1847. During the Revolution it sent out many privateers and in 1778 it was captured by a British fleet and almost destroyed. Population (1940 census), 110,341.

NEW BRUNSWICK, CANADA. Nature and history have combined to cut off New Brunswick, Nova Scotia, and Prince Edward Island—the three Maritime Provinces—from the rest of the Dominion of Canada. The northern projection of the state of Maine thrusts far up between New Brunswick and southern Quebec. Thus the only communication by land is either across the territory of the United States or by a roundabout route. Despite these drawbacks, the value of the ice-free harbors of Saint John, New Brunswick, and Halifax, Nova Scotia, as winter outlets for the grain of the Northwest has led to the construction of three railroad lines linking the Maritime Provinces to the rest of the Dominion—the Intercolonial and Transcontinental (now part of the Canadian National system), and an extension of the Canadian Pacific across the state of Maine.

Lying between the Gulf of St. Lawrence and the Bay of Fundy, New Brunswick contains less than 28,000 square miles. Its surface is for the most part a rolling plain, except in the north and northwest, where low branches of the Appalachian Mountains enter the province from Maine. The soil of the many broad river valleys is exceedingly fertile. Agriculture is the leading industry, and nearly 70 per cent of the 408,219 inhabitants live in the country. The chief crops are hay and potatoes. Of recent years dairying and cattle raising have increased in importance.

These pursuits are carried on on the outer edge of the province, the center of which is all one vast forest. Lumbering is the second industry of importance; and

scarcely a stream of the network of rivers which covers New Brunswick but has its sawmill. The manufacture of wood pulp is becoming increasingly important, and there are several cotton factories. Coal is found in several parts of the province but much of it is in seams too shallow to be workable. Natural gas and oil are exploited on a small scale.

But New Brunswick's chief fame is as a summer playground. It is one of the favorite resorts of the angler and the hunter, for its streams swarm with salmon and other fish, and in its great forest are all kinds of game, both large and small—moose, caribou, deer, wolves, foxes, otters, mink, rabbits, geese, ducks, and partridges. The fisheries along the 600-mile seacoast are also valuable, ranking next to those of British Columbia, Newfoundland, and Nova Scotia.

The first settlement was made by the French on the Bay of Chaleur in 1639. The territory, combined with Nova Scotia under the name of *Acadie*, was ceded to the English in 1713, and in 1755 many of the French inhabitants were deported (*see Acadia*).

Many of the present inhabitants are descended from Loyalists who emigrated from New England in 1784–85, though another large group is of old French Acadian stock. The chief city is Saint John, Canada's principal winter port, lying at the mouth of the beautiful St. John River (*see Saint John*). About 80 miles up the river is Fredericton, the capital, the center of a fertile farming region and the seat of growing manufactures. Here also is situated the Provincial University.

NEWCASTLE-UPON-TYNE, ENGLAND. "Carrying coals to Newcastle" is an ironic old saying. We appreciate its meaning when we sail up the narrow crowded waters of the River Tyne and come to this bustling city at whose docks great steamers and smutty old barges are endlessly loading coal for shipping to other places; for Newcastle is in the center of the coal regions of Durham and Northumberland, and is one of the most important coal-shipping centers of Europe. The city's ship-building yards and locomotive and engineering and ordnance works are among the largest in England. George Stephenson was born near Newcastle and the city was associated with many of the first steps in the development of the railway system. Its factories turn out (among other things) vast quantities of soda, vitriol, bleaching powder, salt and other chemical products, and also earthenware, cement, grindstones, fire brick, and refined lead. It is also one of the largest fruit and vegetable markets in Great Britain.

Newcastle was the site of an old Roman fort to defend the eastern end of the wall that Hadrian built across Britain. Its modern name of Newcastle came in the 11th century when Robert, the son of William the Conqueror, built a castle here. A century later Henry II erected the old castle which is still standing, with the walls 18 feet thick and its turrets 107 feet from the ground—a fine specimen of the Norman stronghold. Population, about 285,000.

WHERE AMERICA is Nearest to EUROPE

NEWFOUNDLAND.

The rugged rock-bound island of Newfoundland, lying at the mouth of the Gulf of St. Lawrence, the gateway to Canada, was the first land discovered by John Cabot in the New World (1497), and on that discovery in part was based England's claims to her possessions in the Western Hemisphere. The immediate result of Cabot's voyage was the growth of the cod-fishing industry which first drew the Englishmen across the wide ocean and helped to make them a nation of seafarers. As early as 1578 about 400 fishing vessels were resorting each year to Newfoundland, of which one-quarter were English.

This early importance of Newfoundland was due chiefly to the great submarine plateau called the Newfoundland Banks, which extends about 300 miles off shore and comes within 100 or 200 feet of the surface; it is supposed to be composed in part of deposits of solid matter from melting icebergs. Even today after four centuries of fishing, the Banks are still the world's greatest cod-fishing grounds. Here is an inexhaustible supply of plankton, the minute floating organisms of the sea on which the larger ocean creatures feed; and while this flood of food continues to drift down from the Pole and up with the Gulf Stream there is little danger that the cod supply will be diminished, despite all that the fishermen can do.

The cold foggy coasts of the island were not, however, favorable to settlement, and the early attempts of Sir Humphrey Gilbert (1583) and other Englishmen to found colonies met with little success. By 1634 there were about 1,750 permanent British inhabitants in the island, besides a floating fishing population of several thousands of various nationalities.

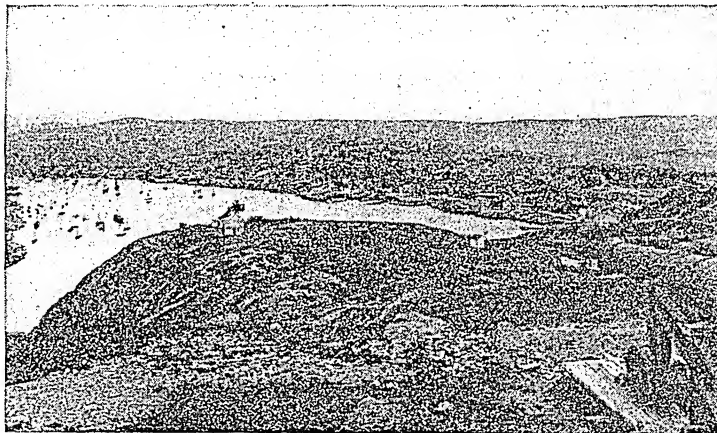
The French, who held Canada, had long attempted to secure control of Newfoundland, and though the treaty of Utrecht in 1713 recognized the sovereignty of Great Britain, France was given the right of catching and drying fish on the northern and western shores. These rights in the "French shore" were retained by France until 1904, when she gave them

Extent.—North to south, about 330 miles; greatest width, east to west, 316 miles. Area, 42,734 square miles. Population, about 290,000. *Physical Features.*—Coast broken by fiords and island-dotted bays; Anguille Range and Long Range mountains in the west and isolated peaks (highest point, 2,084 feet). Principal rivers: Humber, Exploits, and Gander. Grand, Red Indian, and Gander lakes. *Products.*—Fish; lumber and timber products, paper, shipbuilding; iron and copper; hay, potatoes, cabbage, turnips, oats. *Principal City.*—St. John's (capital, about 55,000).

up in return for concessions in Africa. The Newfoundland fisheries have also been a fertile source of disputes with the United States, because of the presence of large American fishing fleets on the Banks; but these are now, in the main, happily ended by treaties covering the subject.

For more than four centuries its fisheries were Newfoundland's chief resource, employing about one-fifth of all its people. But of late years the pulp and paper industry has grown so rapidly that its products are now more valuable than those of the fisheries, and the island ranks among the world's leading paper producers. There are immense deposits of iron and copper. Agriculture is a minor industry despite the government's attempts to encourage it. Only about five per cent of the 5,000,000 acres of land suitable for agriculture has been improved, and the settlements are confined almost entirely to the coast.

THE LAND-LOCKED HARBOR OF ST. JOHN'S



This view is taken from one of the hills which guard the entrance from the sea, and looks northwest over the inner harbor and the city. A bend in the strait keeps storm waves out, and thus makes the bay an ideal harbor.

The interior and the western coast of the island are delightful in summer and possess a mild climate in winter. The fogs rarely penetrate inland. Innumerable lakes fringed with woodland dot the interior, and occupy nearly a third of the total area. Deer, lynxes, foxes, beavers, otters, hares, and game birds abound. The island is the home of the sagacious

and gentle Newfoundland dog. The people of the island are mostly descended from the English, Scotch, and French fishermen who settled there long ago.

The oldest of British colonies, Newfoundland has refused to become part of the Dominion of Canada. In 1934 financial difficulties forced it to give up its dominion status and return to the position of a crown colony. Labrador, with nearly three times its area, is a dependency of the colony (*see* Labrador).

Because Newfoundland is the nearest point of North America to the British Isles (about 1,940 miles to Ireland), it is of great importance as the terminus of cable and airplane routes, and as an outpost of United States defense. Several historic transatlantic flights started at Harbor Grace, and near Gander Lake is one of the greatest flying fields in the British Empire. In 1940 the United States leased sites near St. John's, the capital, for air and naval bases and for an army post. The island has about 800 miles of railroads and regular steamer service to Canada.

The Land of the HEAD-HUNTERS and TREE-DWELLERS

NEW GUINEA. The vast island of New Guinea—second largest on earth—still keeps most of its secrets hidden from the outside world. The white people who have explored its coasts and ventured up its rivers divided the island among themselves long ago. But by far the larger part of its 300,000 square miles is still occupied only by savages, and head-hunting raids and cannibal feasts continue with little possibility of interference.

New Guinea lies north across the Torres Strait from Australia, and just below the Equator (for map, *see* East Indies). It stretches east and west about 1,500 miles and is about 450 miles across at its widest. Greenland is the only island that has a greater area. The western half of New Guinea belongs to the Netherlands; the eastern half, to the British Empire as a dependency of Australia. The number of natives has been estimated at about one million. There are fewer than 10,000 settlers, including whites, Chinese, Malays, and others.

A backbone of mountains, with snow-clad peaks higher than any in the United States, runs nearly the entire length of the island. Rugged spurs extend from this backbone, cutting up the land into deep valleys and isolated plateaus. Great rivers flow down from the mountains, crossing broad belts of forest and swamplands to the sea. The most important river is the Fly, which winds 800 miles southward to the Gulf of Papua; next are the Sepik and the Mamberamo, which empty into the Pacific Ocean on the north. Lakes nestle in hills and valleys, or form chains in the lowlands along the rivers. Where mountain spurs reach the sea, the coast is high and rocky; elsewhere it consists mostly of tidal swamps.

In the rainy seasons, terrific storms sweep the island. In the lowlands even the dry seasons are damp enough

for the giant grasses and the forest trees to continue their lush growth. Acacias, eucalyptus, cypress, and palms of many kinds grow here, along with countless trees that have no English names. Among their

branches cling hundreds of varieties of rare orchids. Great creepers and climbing vines form a tangle so dense that explorers who leave the rivers to cut their way through the forests count two or three miles a day a fair rate of travel. The very soil seems to be alive with the hum of millions of insects. Clouds of mosquitoes hover above water teeming with crocodiles and huge leeches. Brilliantly colored butterflies flutter among the tree tops. The wild life resembles that of Australia, including egg-laying mammals called "spiny ant-eaters," and several marsupials such as the wallaby (a miniature kangaroo), the ring-tailed opossum, and the

bandicoot. The wild pig is New Guinea's largest known mammal. Huge fruit-eating bats abound. Conspicuous among the birds are the ostrich-like cassowary so

BACK FROM THE HUNT



These hunters represent one of the many types of natives in New Guinea. The men in front are holding wallabies they have caught.

HEAD-HUNTERS—NOW GUARDIANS OF THE PEACE



In the center is an English magistrate of the Territory of Papua, a division of New Guinea, and around him are members of the armed native constabulary. Many of these soldiers are recruited from head-hunting tribes.

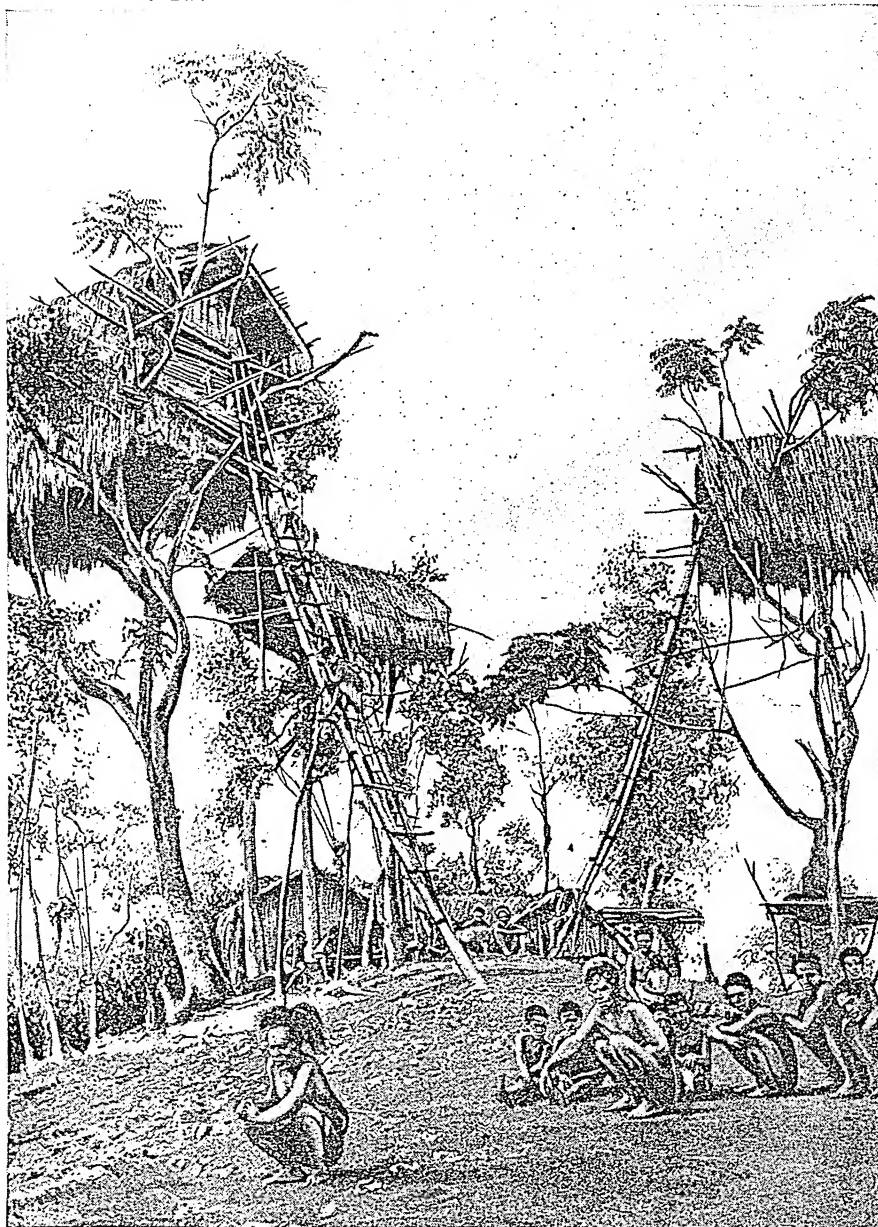
powerful that it can kill a dog with a blow of its foot, the egret, the bowerbird, and the many species of birds of paradise. Lizards, some of great size, and snakes both harmless and poisonous exist nearly everywhere on the island. In the coastal waters live the strange sea-mammals called "dugongs" and numerous great turtles.

The People of New Guinea

From district to district and from tribe to tribe the

natives of New Guinea show an amazing contrast in appearance, customs, and language. Some are black as Negroes; others are no darker than a well-tanned white man. Some are six-foot giants; others, dwarf-like pigmies. A tribe with broad noses and thick lips may have long-nosed and thin-lipped neighbors. There are small groups that live like hunted animals without settled homes and with no more possessions

LIKE THE NESTS OF GIANT BIRDS



Tree houses like these, built of interwoven sticks and covered with long grass, are common on the New Guinea coast. They serve as refuges from unfriendly neighbors and as dwellings for the unmarried girls of the tribe. The ladders may be pulled "upstairs" as added protection.

than they can carry on their backs. There are also great tribes with an elaborate social organization and a remarkable skill in architecture, boat-building, sculpture, painting, weaving, and pottery-making. Measured on the scale of the history of white civilization, the culture of the New Guinea natives ranges from that of the "dawn men" of Europe to that of the lake dwellers of Neolithic times (*see Man*).

The best-known of the natives belong to the so-called "Papuan" types. They are sooty brown to deep black, with long frizzly hair. Many of the Papuans

have oval faces with prominent noses, high cheekbones, and high foreheads. The men are nearly naked; their bodies are decorated with knife scars in intricate pattern, made when they graduate from boyhood. They wear necklaces of teeth and shells, earrings, feathered headpieces, and cassowary bones thrust crosswise through the middle cartilage of the nose. The women generally wear grass skirts and much simpler ornaments than the men.

The typical Papuan village lies near a river bank, hidden behind a screen of trees. The buildings are well made of log frames with thatched walls and roofs. Near the river are concealed the great war canoes skilfully hollowed out of huge tree trunks with axes and adzes made of stone or shell. Gardens fringe the village where the women raise yams, taro, bananas, and sugar cane. Other food comes from the sago palms and breadfruit trees in the near-by forest.

The family houses surround a long clubhouse and armory, called a *dubu*, strictly reserved for men. In front of the *dubu* is an open space where the wild tribal song-dances are held to the intricate rhythms of drums. Inside the *dubu* hang mar-

velously carved and painted canoe paddles, bows and arrows, spears, and daggers made from cassowary bones and human shinbones. Most prized of all are the exhibits of human skulls and smoked heads, each one representing a victim killed and perhaps eaten. Cannibalism and head-hunting have stopped near the coast, but they persist in remote areas.

The White Man in New Guinea

Portuguese and Spanish adventurers of the early 16th century were probably the first white men to sight the coast of New Guinea. In 1606, a Spaniard, Luis de

Torres, sailed the strait between New Guinea and Australia which bears his name. The Dutch annexed the island in 1793, and Germany and Great Britain declared protectorates in the eastern half in 1884. British New Guinea passed into Australian control as the Territory of Papua in 1906, and German New Guinea (Kaiser Wilhelm's Land) went to Australia as the Mandated Territory of New Guinea by decision of the League of Nations in 1920.

As elsewhere in the Pacific, the oldest resource of New Guinea is copra, the dried meat of the coconut. Rubber and sisal hemp are also raised on plantations under European direction. The forests teem with valuable timber, as yet largely unexploited. Petroleum has been found in several regions. The mountains, young and rugged like the Rockies, promise vast deposits of minerals and gems, and are already yielding some gold, copper, silver, and osmiridium. But tangled jungles and jagged cliffs bar the way to the mineral wealth. During a recent gold boom at Wau, less

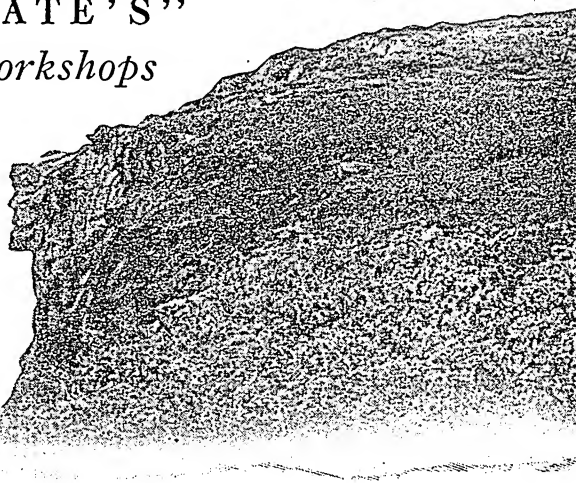
than 50 miles inland, the gold-mining dredges had to be brought in piece by piece in airplanes.

In recent times the airplane has enabled missionaries, government officials, and explorers to gain more knowledge of the interior. Since few white men can stand constant work in the hot climate, the governments have tried to enlist the more energetic tribes in projects such as rubber growing and forestry.

Before Japanese invasion in 1942, Dutch New Guinea was administered as a province of the Netherlands East Indies, with its capital at Merauke. Australia's Mandated Territory of New Guinea included also part of the Solomon Islands and the Bismarck Archipelago, comprising New Britain, New Ireland, and the Admiralty Islands. Lae on New Guinea was named the capital in 1941, because of volcanic eruptions at the old capital, Rabaul in New Britain. The area is about 69,700 square miles. The territory of Papua (area, about 87,800 square miles) had its capital at Port Moresby on the southeast coast. It included, to the east, the Louisiade Archipelago, the d'Entrecasteaux Islands, and the Trobriand Islands. The Trobriand natives have become famous because of the detailed studies of their customs and culture, made by the distinguished anthropologist Bronislaw Malinowski.

The "GRANITE STATE'S" Playgrounds and Workshops

The "Great Stone Face," about which Hawthorne wrote his fascinating story by that name, is clearly to be seen at the left of this picture. From its high place away up on the cliffs bordering Franconia Notch in the White Mountains of New Hampshire, it overlooks a picturesque region of valleys, glens, waterfalls, brooks, and lakes.



NEW HAMPSHIRE.

Most people think of New Hampshire, "the granite state," chiefly as a playground, and indeed it does resemble a vast and beautiful park. Practically the whole of the White Mountain region, which occupies the northern half of the state, is devoted chiefly to recreation, either as a result of government reservation or through the enterprise of clubs and societies interested in the great out-of-doors. Here are crisp air, mountains of varying heights for climbers of various strengths, fine hotels, and good motor roads. Bare white summits here and there overtop the cloak of pines, maples, hemlocks, and spruces that cover them to the vegetation line, and imposing valleys open to view from the roads.

Extent.—North to south, 180 miles; east to west, 95 miles. Area, 9,304 square miles. Population (1940 census), 491,524.

Natural Features.—White Mountains in northern half (highest peak, Mt. Washington, 6,288 feet), and Mt. Monadnock (3,166 feet) in southwest. Connecticut River (western border) and Merrimack River, Lake Winnepesaukee, and smaller lakes near center. Low country in southeast with 18-mile strip of seacoast. Mean annual temperature, 43°; mean annual precipitation, 39".

Products.—Boots and shoes; cotton, woolen, and other textiles; paper and pulp goods; lumber and timber products; granite, clay products, feldspar, mica; poultry, dairy products; apples, hay, potatoes.

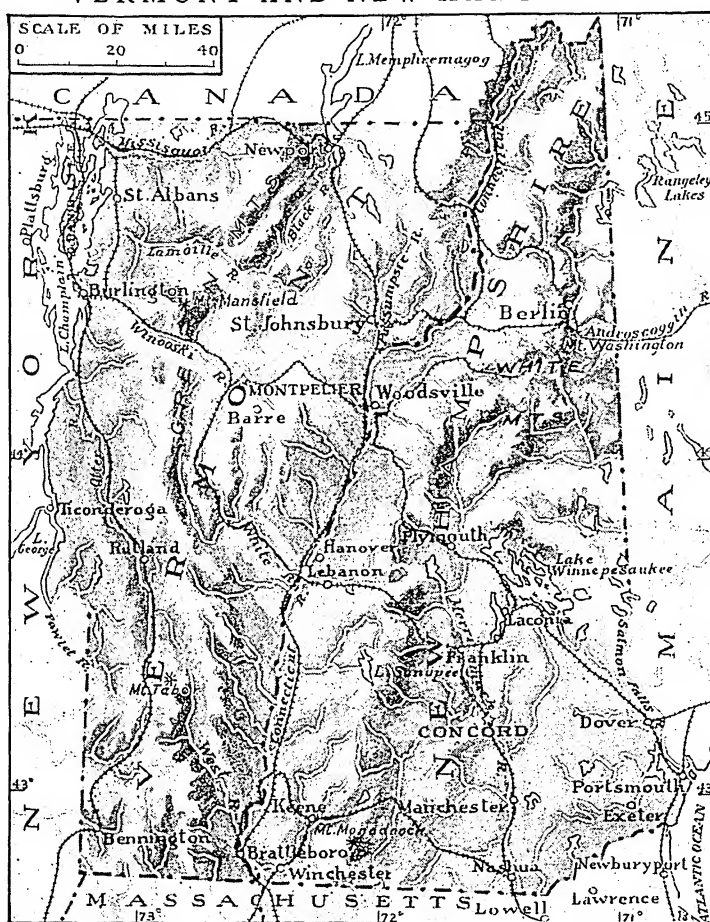
Cities.—Manchester (77,685), Nashua (32,927), Concord (capital, 27,171), Berlin (19,084), Dover (14,990), Portsmouth (14,821), Keene (13,832), Laconia (13,484).

The most picturesque spot is perhaps the Franconia Notch, a wooded defile about five miles in length which gaps the western group of the White Mountains about midway in their course.

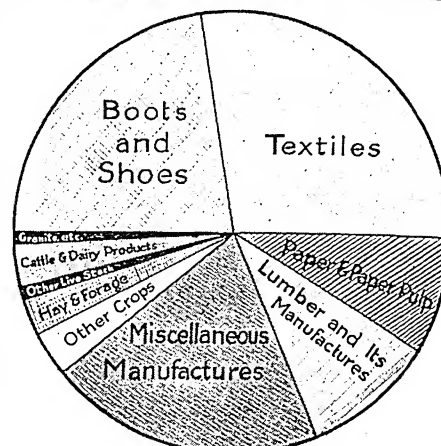
It is dominated by Pro-

file Mountain, whose upper cliffs form the "great stone face" of Nathaniel Hawthorne's story. Mount Washington towers higher than any other peak in New England, and is among the highest in the whole of the Appalachian system. For people who find its trails difficult, the top is accessible by a cog railway and a good motor road. Mount Monadnock (3,166 feet), familiar to readers of Emerson's poems, is not a part of the White Mountains but is an isolated peak in southwestern New Hampshire.

VERMONT AND NEW HAMPSHIRE



AGRICULTURE	MANUFACTURING	TRADE AND TRANSPORTATION	OTHER OCCUPATIONS
-------------	---------------	--------------------------	-------------------



OCCUPATIONS AND INDUSTRIES
IN THE "GRANITE STATE"

Small as it is, New Hampshire is an important factor in the nation's prosperity, for its abundant water-power drives the wheels of many great shoe and textile factories.

mountain regions to the sea. The Connecticut River, which forms the northern as well as the entire western boundary of the state, and the Merrimack, which rises in the White Mountains and drains the lake region, are the chief streams. The

The White Mountain tourist season used to be a short one, extending only over the middle of the summer. As late as June you might meet a bear by some woodland spring. Nowadays people are beginning to see the out-of-door possibilities of the long severe winters that used to frighten them away. Winter sports flourish, particularly skiing, and the outing club of Dartmouth College at Hanover (in the foothills, on the Connecticut River) has built a whole chain of mountain cabins for winter use. In the eastern part of the state, opposite Hanover, lies New Hampshire's lake region, where a number of small clear lakes attract summer campers and cottagers. The largest of these, Lake Winnepesaukee, is about 22 miles long and from one to ten miles wide.

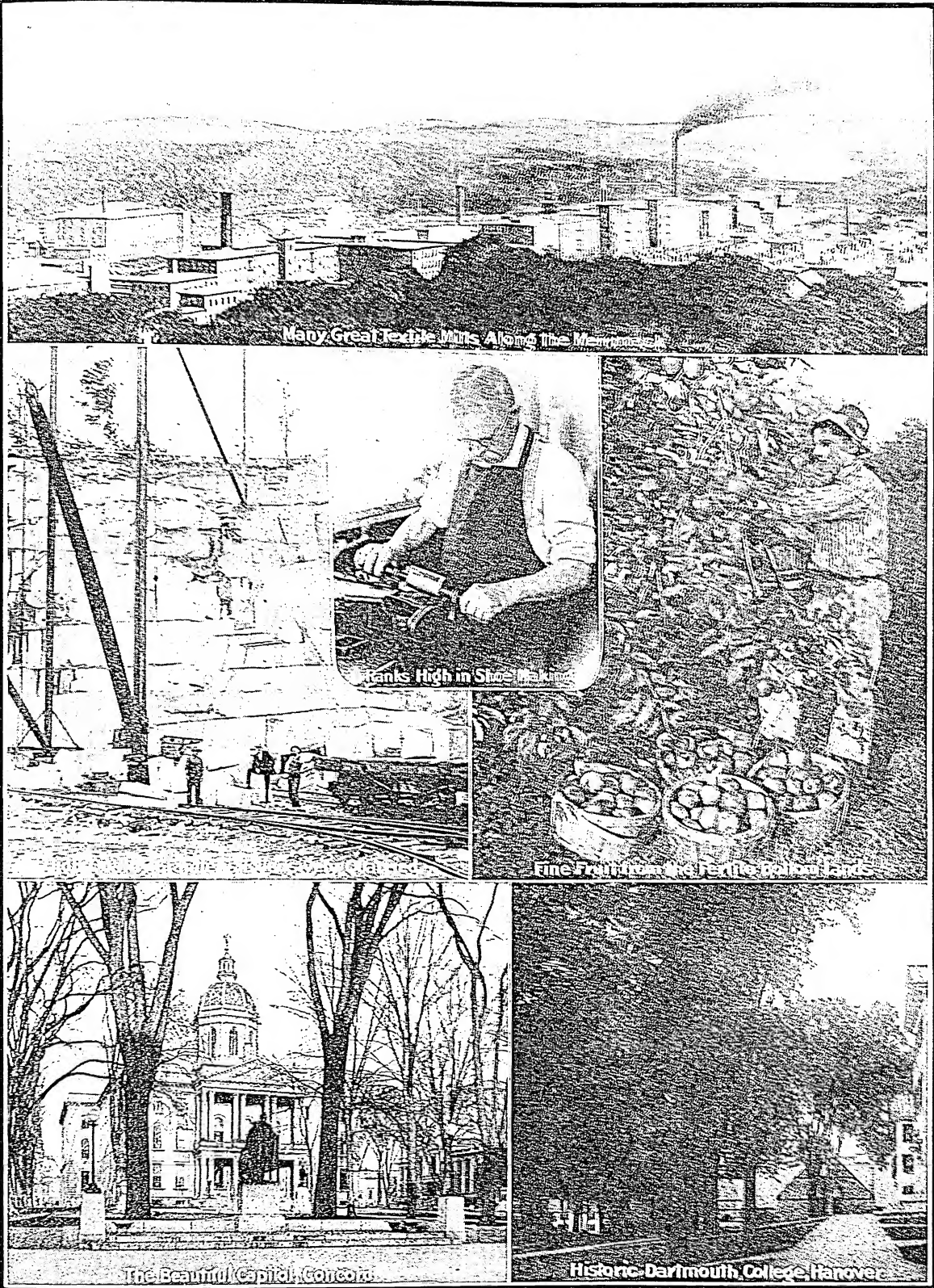
But the state has its working as well as its play side. Although in size it ranks only 43rd among the United States, with an area of 9,304 square miles, and its population is less than that of the city of Milwaukee, it stands high in the manufacture of boots and shoes, and well to the top in the textile industries. It also ranks high in granite-quarrying, in lumbering, and in the making of wood-pulp for paper, for the surface of the state is one-third forest. Abundant water-power is furnished by the rivers which tumble from the

Merrimack, owing to its numerous water-power sites, has probably more cotton spindles in operation along its course than any other river in the world.

New Hampshire is also interested to a considerable extent in agriculture, notably truck-farming, fruit, poultry, and dairying, for the bottom lands of the Connecticut and Merrimack, and the southeastern section, have a fertile soil. And although it has the shortest coast-line of the Atlantic States (about 18 miles) and only one port (Portsmouth on the Piscataqua River), New Hampshire supports fisheries for lobster, haddock, etc., as well as considerable shipping. At Portsmouth is located one of the United States navy yards, and it was in this little city that the treaty of peace between Russia and Japan was signed in 1905.

Its industrial activity has led to the concentration of New Hampshire's population in about nine small cities. The largest of these is Manchester in the southern part of the state on the Merrimack and Piscataquog rivers. It is an important trade city. Its diversified manufactures include shoes, textiles, and cigars. The Gallery of Art and the large public library reflect the cultural interests of the city. Nashua, about 15 miles south of Manchester on the Nashua River, has large cotton mills and a variety

CONTRASTS OF NEW AND OLD IN NEW HAMPSHIRE



Many Great Textile Mills Along The Merrimack

Stanks High in Shoe Making

Fine Fruit from the Fertile New England Lands

The Beautiful Capitol, Concord

Historic Dartmouth College, Hanover

No New England state shows better than New Hampshire the contrast between the twentieth century, with its busy factories, and bygone generations whose memory is recalled by quiet tree-shaded walks among old historic scenes.

of other manufactures, and is the distributing center for an extensive agricultural district. Concord, the capital, on the Merrimack, is likewise a manufacturing center and in its neighborhood are extensive quarries of fine-grained white granite. It is the seat of St. Paul's School. This school and Phillips Exeter Academy at Exeter are among the most famous schools for boys in the United States. Higher education is offered by Dartmouth College at Hanover, the University of New Hampshire at Durham, and St. Anselm's College (Roman Catholic) for men at Manchester, as well as by the state teachers colleges at Keene and Plymouth.

The early history of New Hampshire is a story of isolated settlements for fishing and fur-trading, woven into a bewildering maze of English land grants to absentee companies or landlords. The first settlements were at the mouth of the Piscataqua, in 1623. John Mason and Sir Ferdinando Gorges were the most

prominent grantees of the region between the Merrimack and Piscataqua rivers, and it was Mason who conferred upon it the name of New Hampshire, after his own county of Hampshire in England. Both of these grantees were staunch Church of England men and friends of King James I. There were long jurisdictional disputes with Massachusetts arising in part out of conflicting grants, and for over 70 years New Hampshire was either a part of Massachusetts or under the same governor (appointed by the crown). The colony became a separate province in 1741.

The boundary dispute was settled in 1740, very much to New Hampshire's advantage. The decision established as the charter line "three miles north of the Merrimack," the present boundary paralleling the river from its mouth to its most southern point, instead of to its source, as Massachusetts claimed. There were also long disputes with New York due to conflicting claims to what is now Vermont. These continued until the admission of Vermont as a separate state, in 1791, established the Connecticut River as New Hampshire's western boundary.

New Hampshire was the ninth state to ratify the Federal constitution (June 21, 1788), thus completing the number needed to start the new government.

NEW HAVEN, CONN. The "City of Elms," famed for 200 years as the seat of Yale University, is situated at the head of New Haven Bay, an inlet of Long Island Sound 72 miles northeast of New York City.

New Haven is Connecticut's second city in population and manufactures, and one of the foremost educational centers of the United States.

A line of rugged hills, ending in two 360- and 400-foot spurs called East Rock and West Rock, rises in the background and looks down upon the city built on a level sandy plain. In the central older part it is laid out in squares around the 16-acre public Green (once a religious and social center). To the north and east of the Green rise the many fine buildings of Yale University. New Haven has many handsome public buildings, parks, gardens, and broad shaded streets.

With its harbor, and the main line and branches of the New York, New Haven, and Hartford Railroad, New Haven has good shipping facilities

and is a distributing point for the coal, cement, lumber, and fertilizer brought there by water. The wheels of industry hum in its manufactures of firearms and ammunition, hardware, clocks, rubber goods, and foundry and machine-shop products. The Winchester Repeating Arms and the New Haven Clock Company are two of the important factories, and the large machine shops and general offices of the New York, New Haven, and Hartford are located here.

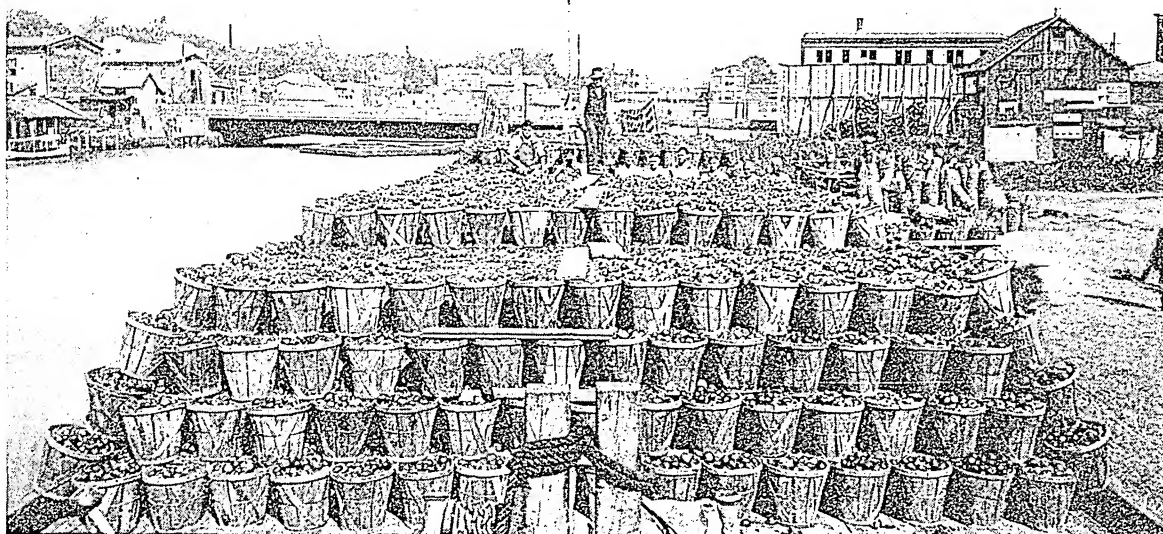
New Haven was called by its Indian name *Quinnipiac* (Long River Place) in 1638 when Theophilus Eaton, John Davenport, and a small company of Puritans settled there; but two years later it received its present name (from Newhaven, England). It remained a separate colony from Connecticut until 1662. From 1701 to 1873 New Haven was joint capital with Hartford. In 1716 Yale College was moved here from Saybrook. New Haven is the burial place of Noah Webster, Samuel Finley Breese Morse, Lyman Beecher, Eli Whitney, Roger Sherman, and other famous men. Up on West Rock is Judges' Cave, the famous hiding place in 1661 for the regicides Goffe and Whalley. Large foreign groups today far outnumber the descendants of the old New England families. Population (1940 census), 160,605.

LOGGING IN THE WHITE MOUNTAINS



In the winter time, when the White Mountains are white with snow, the loggers set to work hauling out the big trees and the many lumber camps are busy getting material ready for next year's market.

NEW JERSEY, the "GARDEN STATE"



NEW JERSEY. "Like a cider barrel tapped at both ends" was Benjamin Franklin's description of New Jersey; for in his time the growth of Philadelphia and New York as great commercial centers tended to attract many of New Jersey's inhabitants to those cities. Today, although New York and Philadelphia still "tap" New Jersey for its luscious fruits and fresh vegetables, which pour into those cities in great quantities from early spring to late autumn, the situation is reversed with regard to its people. Every afternoon tides of New Yorkers and Philadelphians, their day's work done, pour by train and ferry into New Jersey; for the population of these giant cities has overflowed their boundaries, and Hoboken, Jersey City, Newark, and Elizabeth have long been residential suburbs of New York, while New Jersey's cities farther south house thousands of Philadelphia's busy workers.

There are only three states in the Union smaller than New Jersey; but no state produces a greater variety of manufactured articles, or, in proportion to its size, a greater number of agricultural products. Situated in the midst of the most thickly populated region of the Union, its unexcelled market advantages make truck gardening, dairying, and poultry raising great industries; while, with Pennsylvania coal near at hand, and excellent transportation furnished by rivers, railroads, and the great New York harbor, New Jersey is bound to occupy a favored position as regards manufacture.

Extent.—North to south, 168 miles; east to west, 88 miles. Area, 7,836 square miles. Population (1940 census), 4,160,165.

Natural Features.—Kittatinny Mountains in the northwest (highest point, 1,801 feet); the Highlands, crossing state from north to southwest; Piedmont Plain and Coastal Plain in the south. Principal rivers: Delaware, forming the western boundary, and Hudson on the east; Hackensack, Passaic, Raritan, Mullica, and Great Egg flowing into Atlantic Ocean, and Maurice into Delaware Bay. Mean annual temperature, 52°; mean annual precipitation, 45".

Products.—Smelted copper; silk, other textiles, and clothing; chemicals, refined petroleum, iron and steel, machinery, meat products, automobiles and parts, rubber goods, leather goods, pottery, glass; corn, hay, potatoes; cattle, hogs, dairy products; fish; clay, stone, zinc, sand and gravel.

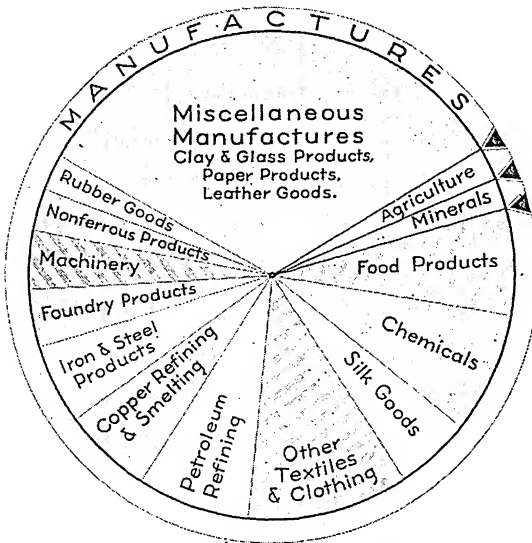
Cities.—Newark (429,760), Jersey City (301,173); Paterson, Trenton (capital), Camden, Elizabeth (over 100,000); Bayonne, East Orange, Atlantic City, Passaic, Union City, Irvington (over 50,000).

There are five distinctly marked sections in New Jersey, running in almost parallel strips across the state from northeast to southwest. Paralleling the Delaware River along the northwestern border are the rocky and heavily wooded Kittatinny

Mountains, a continuation of the Pennsylvania Appalachians rising to 1,800 feet—a favorite resort for visitors in summer. South of these mountains lies a wide valley section with rolling country, pleasing landscapes, and beautiful farming lands famous for their garden crops, fruits, and poultry. The third section, extending also from northeast to southwest, is the Highlands, a hilly or mountainous region of limited agriculture and population, but superb natural scenery. Still farther south is a piedmont plain, level and gently rolling, known for its large crops of "garden truck"—potatoes, tomatoes, fruit, corn, and the like. At the extreme south lies the fifth section, a coastal plain covering half the entire state. Much of this region is undeveloped; for here lie The Pines, a wooded area of considerable extent, and large areas of sandy soils. But market gardening, fruit growing, cranberry cultivation, and poultry raising are increasing, and skilful handling has produced crops greater even than those grown on the naturally rich lands of other states. The general altitude of the state is so low that if the land were to sink 100 feet, nearly half of it would be under water; only the northern third and a group of islands in the middle part and another in the southeast would remain above sea level.

PRODUCTS OF FACTORY AND WORKSHOP

So varied are the manufactures of New Jersey that the largest segment of this products chart is taken up by those classed as "miscellaneous." Silk and other textiles form the next largest group. The leading occupations are compared in the chart beneath.

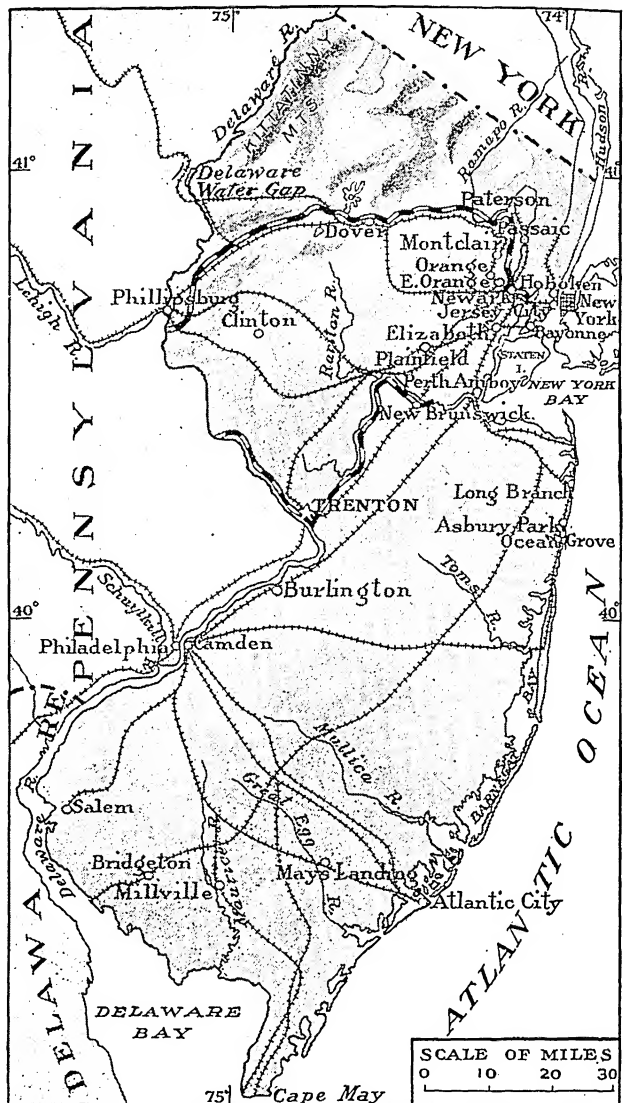


AGRICULTURE	MANUFACTURING	TRADE & TRANSPORTATION	OTHER OCCUPATIONS

The Jersey coast is famous throughout the world for its summer resorts. From Sandy Hook to Cape May, a distance of 125 miles, is one of the chief summer playgrounds of the country, owing to its pleasing climate, splendid level bathing beaches, and the many inlets and bays which afford ideal conditions for sailing and yachting. Some 20 miles south of "the Hook," so familiar as a landmark to vessels inward bound for New York, is Long Branch, situated on a bluff and broad plateau, with many wide avenues and immense hotels. Not far away is Asbury Park, with its fine beach, good hotels, pavilions, and parks; and Ocean Grove, which contains one of the largest auditoriums in the country, and is separated from Asbury Park by Wesley Lake. To the south is the famous Atlantic City, the largest all-the-year-round resort in the United States (see Atlantic City, N. J.); while at the extreme tip of the state lies Cape May, a fashionable watering place with a magnificent beach. Many smaller resorts dot the coast, almost every mile of which has been more or less developed.

Unsurpassed in Variety of Manufactures

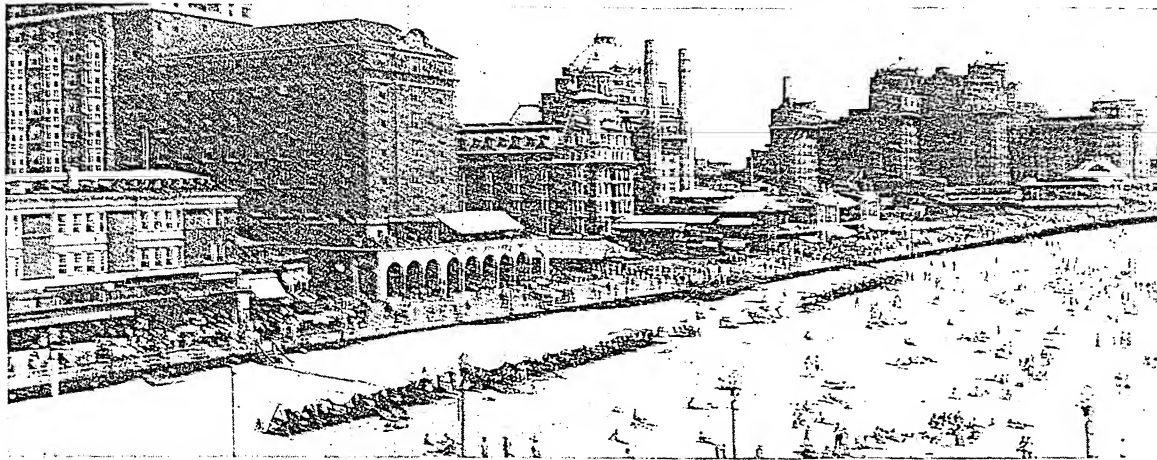
Large near-by markets, unexcelled transportation, and the valuable minerals of the state and its neighbor, Pennsylvania, all help make New Jersey one of the most important manufacturing states in the Union. It holds a high place in the total value and variety of manufactured articles. Large proportions of all the rubber goods and dyed and finished textiles in America



are part of New Jersey's output, and the state is among the foremost in smelting and refining copper, oil refining, canning and preserving, and also in the manufacture of silk, chemicals, paint, and varnish. In addition, meat packing, baking, and the making of cigars and cigarettes, electrical machinery, foundry and machine shop products, and automobiles give employment to thousands.

Since manufacturing is so extensive in New Jersey, more than 80 per cent of its population lives in cities. The region about New York, although it contains several municipalities, seems almost like one continuous city. Newark is said to produce a greater variety of goods than any other American city. Jersey City also has hundreds of diversified industries, and Paterson is the silk center of the nation. Trenton, across the state, is famous for pottery of all kinds, made from the clay deposits which run throughout the state. (See Jersey City; Newark; Paterson; Trenton.)

A PART OF THE 125 MILES OF "SWIMMING HOLE"



This is part of Atlantic City's beach and boardwalk, which attract some 15,000,000 visitors a year. New Jersey has about 125 miles of fine wide beaches like this and its seaside summer resorts are famed the world over.

Elizabeth and Bayonne are part of the smoking, sweating workshop around New York. Elizabeth is the home of hundreds of commuters to the great city across the Hudson. Its waterfront along Newark Bay handles heavy traffic in Pennsylvania coal and in cotton. Goethals Bridge connects the city with Staten Island. Sewing machines, automobiles, oil and gas, printing presses, ships, and metal furniture are Elizabeth's contributions to the prosperity of this region. Already old when the Revolution began, Elizabeth has dozens of time-mellowed colonial homes. The town was settled in 1665 and named for the wife of Sir George Carteret, one of the English proprietors of New Jersey. The future Princeton University was founded here in 1746 as the College of New Jersey, and the city was the capital of New Jersey colony from 1668 to 1686. Aaron Burr, Alexander Hamilton, and Gen. Winfield Scott were early residents.

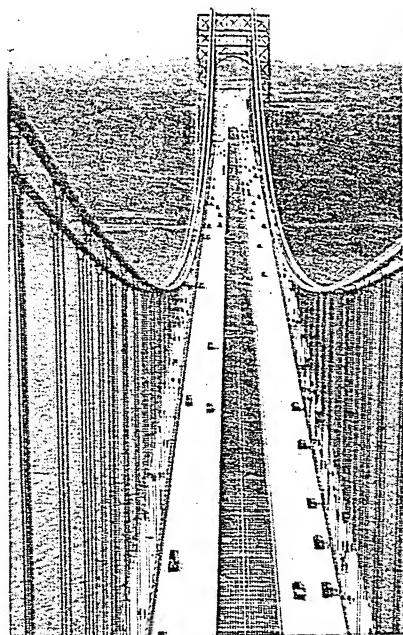
Bayonne and Camden

Enormous oil refineries dominate Bayonne's industry. This is the eastern terminus of oil pipe lines that extend even to the Texas and Oklahoma fields. Construction began in 1941 on a great naval base. The city lies on a long peninsula which separates Newark Bay from Upper New York Bay. Its southern tip is separated from Staten Island by the narrow channel, Kill Van Kull, spanned by a high arched bridge. Makers of chemicals, boilers, radiators, coal machinery, brass cast-

ings, and wire and cable labor in Bayonne's factories. The city is made up of the old Dutch villages Pam-rapo, Bayonne, Centerville, and Bergen Point. The Dutch began to come there about 1665. Bayonne got its city charter in 1869, and has had a commission government since 1915.

A giant bridge spans the Delaware River between Camden and Philadelphia. Though Camden is miles

NEW YORK TO NEW JERSEY



Linking Manhattan to the Jersey shore, this 3,500-foot span of the \$60,000,000 George Washington bridge is carried on steel cables suspended from two towers, each higher than the Washington monument. Over its four roadways, 30,000,000 vehicles can cross the Hudson annually between New York and Fort Lee. The Palisades are visible in the distance.

from the sea, ships leave its docks on the Delaware and Cooper rivers to call at Baltimore, Houston, and Pacific ports. Camden factories make almost everything from soup to ships, including radios, pens, linoleum, leather and knit goods, paint, soap, and plumbing fixtures. Jacob Cooper laid out the town in 1773, on a site which had been occupied by a Quaker settlement since 1681, and named it after Lord Chancellor Camden, who had befriended the American colonies by fighting against the Stamp Act. The British took Camden with Philadelphia during the Revolution. Walt Whitman lived in Camden for years. His home is kept by the city as a memorial. Commission government was adopted in 1923.

State is Rich in Minerals

New Jersey's mineral resources must not be overlooked; for although the state is 45th in size, it ranks about 20th in the value of its mineral products. This wealth consists chiefly of pottery and other clays in every variety which the United States produces. They are dug in all counties but one.

New Jersey has zinc mines which produce ore of a high grade, and much ore from other states also is smelted. Iron is also mined, stone is quarried, and several million dollars' worth of sand and gravel are obtained yearly. In its greensand marl deposits, which contain glauconite (a silicate of iron and potassium), the state possesses a potential source of potash which is of incalculable importance.

Nearly every kind of fruit and vegetable finds a congenial soil and temperature in some part of New Jersey. Peaches and apples are cultivated extensively. The southern counties produce large quantities of strawberries, raspberries, and blackberries, and an annual yield of cranberries that is one-fourth of the total produced in the United States. Grapes are also much grown in the south, and plums, cherries, and currants are common to all sections. Jersey sweet potatoes, admitted to be the "sweetest of the sweet," are grown in large quantities, and the state ranks second in the growing of asparagus. Great poultry farms are found in the north, and dairying is important in almost every part of the state.

The growing of flowers for the cut-flower trade is another industry that has grown to immense proportions, in recent years the value of roses alone reaching annually into hundreds of thousands of dollars.

With its long stretch of sea-coast, and the Delaware and Hudson rivers, New Jersey is well adapted to the fishing industry. Along the coast and in Delaware Bay are about 15,000 acres of productive oyster beds, and vast quantities of clams and fish of many kinds are sent each year to the near-by markets.

History of New Jersey

New Jersey was well "discovered" by the time the Dutch settled at Fort Nassau on the Delaware, near the present Gloucester City, and on the Hudson, at Hoboken, early in the 17th century. It passed through many hands before it became a state.

John Cabot, the Italian navigator sailing under the English flag by commission from Henry VII, reached Jersey shores in 1498 in the course of his voyage of exploration along the Atlantic coast. He was followed by Giovanni da Verrazano under the French flag in

1524; the Portuguese mariner, Estevan Gomez, the next year; and Henry Hudson for the Dutch in 1609. Swedish colonists built Fort Elfsborg near the mouth of the Delaware around 1643, and threatened to become a rival of Holland before New Sweden passed to the Dutch in 1655. Meanwhile, the Lenni-Lenape or Delaware Indians took every chance to attack the

white trespassers on the land they called Scheyichbi ("land bordering the ocean"). The Lenni-Lenape Indians, whose name means "a man of our men," were fleet-footed, well-built, treacherous people. They lived in lodges built of saplings and covered with bark. The first Indian reservation in the country was set aside for these Indians in 1758.

England in 1664 laid claim to the whole region about the mouth of the Hudson, and New Jersey was granted to Lord Berkeley and Sir George

Carteret. The name "New Jersey" was given in honor of Carteret, who had been governor of the island of Jersey. The province was divided into East and West Jersey. By 1682 William Penn and several other Quakers had become the proprietors of both the Jerseys. New Jersey had the same governor as New York from 1702 to 1738 (*see American Colonies*).

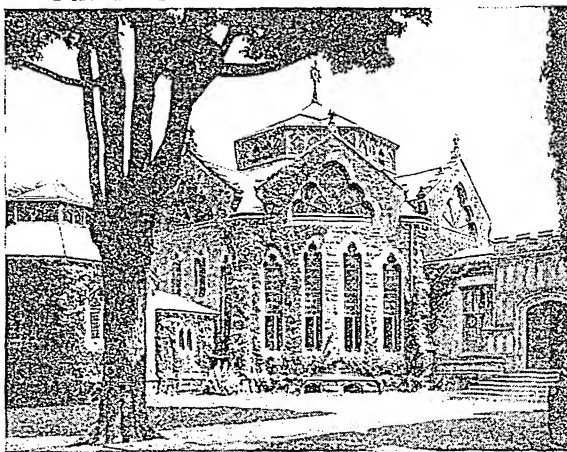
Princeton University was founded in 1746; and Rutgers University (the State University) was established as Queen's College in 1766 at New Brunswick.

Like Boston, New Jersey had a "tea party"—at Greenwich, near Delaware Bay, in 1774, when young men in Indian costume burned a whole shipload of tea from England. New Jersey witnessed some of the most dramatic events of the Revolution—the retreat of Washington, the capture of the British at Trenton, and the battles at Princeton and at Monmouth. In the latter, according to a popular story, the heroic Molly Pitcher manned her dead husband's cannon.

Washington and his army spent several winters at Morristown. (*See Revolution, American*.)

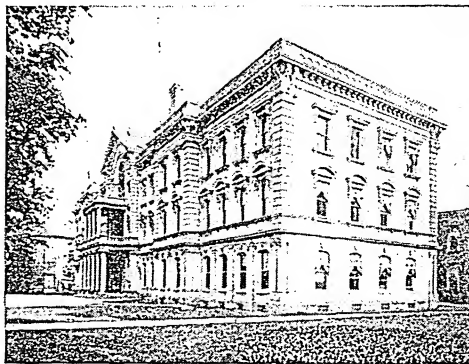
At the Constitutional Convention after the war, New Jersey hesitated to strengthen the Union out of fear of the larger states, and put forward the "New Jersey Plan," which proposed equal representation of

PART OF "OLD NASSAU" CAMPUS



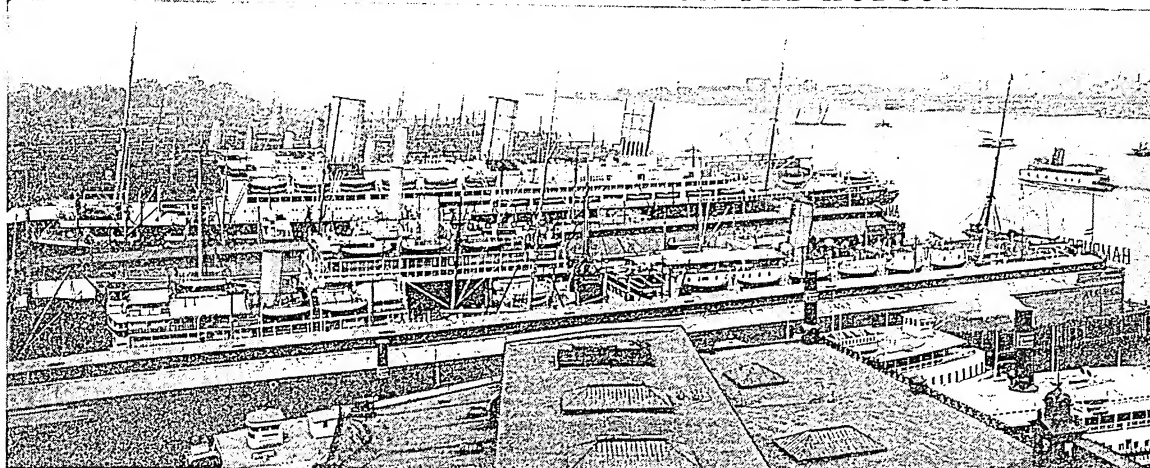
The Chancellor Green Library at Princeton University, built in 1873, is one of the many beautiful buildings.

THE STATE HOUSE, TRENTON



New Jersey's capitol building, situated on West State Street, differs in architecture from most state capitols, which are surmounted with domes, following the fashion of the National Capitol.

HOBOKEN'S WATERFRONT ON THE HUDSON



Here are some of the docks at Hoboken, with a typical assortment of steamers, big and little, receiving and discharging cargo. The docks in the foreground were taken over from German shipping interests when the United States entered the World War, and saw the embarkation of thousands of American soldiers on the way to Europe. New York City is visible in the background.

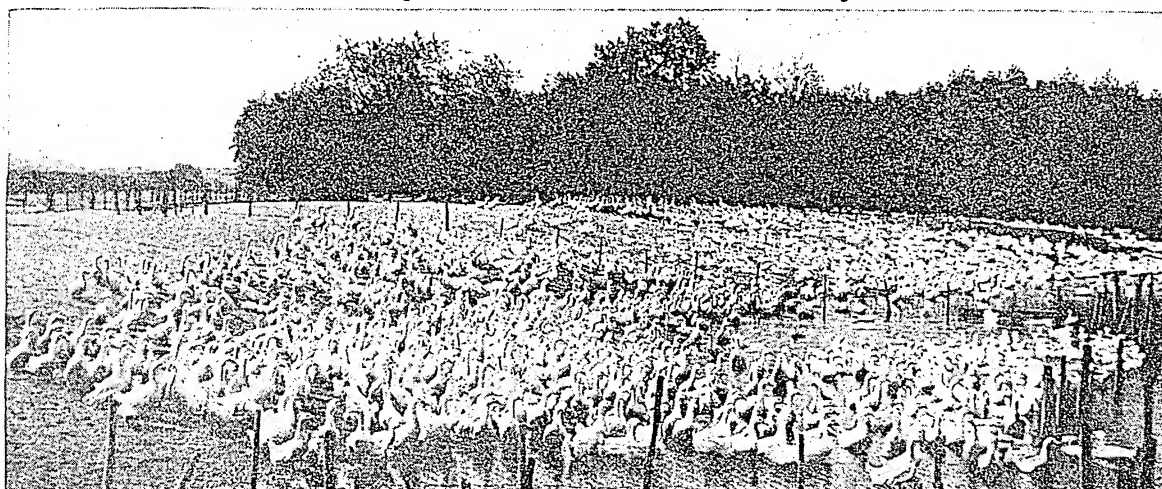
the states in a single legislative body. This plan was partly adopted in the make-up of the Senate (*see* United States, Constitution). New Jersey started the Morris Canal in 1824 and the Delaware and Raritan Canal in 1826, and finished its first railway—the Camden and Amboy—in 1834. Because so many great corporations were organized under the liberal laws of the state, New Jersey was called the “home of trusts.” However, in 1913, the state passed the “Seven Sisters” acts against monopoly, price fixing, and restraint of trade.

Alexander Hamilton fought his fatal duel with Aaron Burr at Weehawken in 1804. Joseph Bonaparte, brother of Napoleon and ex-king of Naples and of Spain, lived in exile in a splendid house not far from Trenton, during 1815-39. Samuel F. B. Morse sent his first telegraph message at the Vail iron works near

Morristown about 1838. John Fitch, a Trenton clock-maker, built one of the first steamboats in 1787. Sea heroes from New Jersey include William Bainbridge and James Lawrence in the War of 1812 (*see* Lawrence, James), and Robert F. Stockton, who aided in the conquest of California. Woodrow Wilson was governor of New Jersey when elected to the presidency in 1912.

New Jersey's governor has large powers in appointments, since he names the secretary of state, attorney-general, chief justice, and judges of the various courts, in addition to several other state officials. The governor serves three years, and cannot succeed himself in office. State senators are elected for three years, and assemblymen for one year. The original constitution of the state, drawn up in 1776, permitted woman suffrage. The second and present constitution was adopted in 1844.

A WHOLE QUACKING ACRE IN NEW JERSEY



If you could “hear” this picture as well as see it, you would simply have to cover up your ears. For you know how ducks—there must be an acre of them here—quack when they get sight of water. Duck raising is one of the most profitable side lines of the New Jersey farms and truck gardens.

NEWMAN, JOHN HENRY, CARDINAL (1801-1890). When all else that Newman did and wrote has been for the most part forgotten, his name will still be kept alive by his well-known hymn:

Lead, Kindly Light, amid the encircling gloom,
Lead Thou me on!
The night is dark, and I am far from home;
Lead Thou me on!
Keep Thou my feet; I do not ask to see
The distant scene,—one step enough for me.

These beautiful lines have found their way into almost every heart and hymn-book. Newman composed them in 1833, while on shipboard returning to England from a voyage to the Mediterranean, before the religious questionings had arisen which led him from the Church of England to the Church of Rome. During his long life his work was largely a passionate expression in masterly prose of intellectual struggle and spiritual quest.

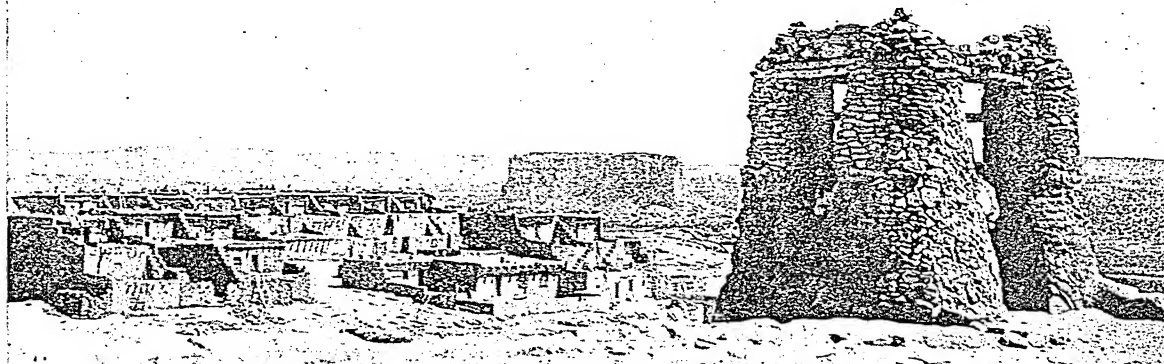
Two years after taking his degree at Trinity College, Oxford, he obtained a fellowship at Oriel, "the center of Oxford intellectualism." Always of a dreamy religious temperament, he became a clergyman of the

Church of England as well as an Oxford tutor. He became a leading spirit in the famous "Oxford movement," a High Church reaction which manifested itself in a series of 'Tracts for the Times', of which he was the chief author. His romantic vision of the medieval church restored in its power and grandeur gradually led this simple sincere ascetic, with grave kind eyes and a thoughtful smile, into the Roman Catholic church, which he called "a home after many storms." He was ordained a priest at Rome in 1845, and was appointed a cardinal in 1879. He died at Birmingham on Aug. 11, 1890.

It was in his many sermons, lectures, and writings that Newman became one of the great religious forces of his day. The spiritual fervor, the searching subtle intellect, and the charm of his personality were supplemented by a fine prose style which for ease, clearness, and beauty has seldom been surpassed.

Among Newman's many important writings are his 'Apologia pro Vita Sua' (1864); 'Verses on Various Occasions' (1868) which includes the beautiful 'Dream of Gerontius'; 'An Essay in Aid of a Grammar of Assent' (1870); and 'Letter to the Duke of Norfolk' (1875).

NEW MEXICO—WONDERLAND of RUGGED BEAUTY



NEW MEXICO. The strange beauty and charm of the ancient land to which its white inhabitants have given the name of New Mexico have been summed by the Western novelist Zane Grey, who knew it well. He spoke with enthusiasm of the "red rocks, the alkali flats like snow, the sand dunes so graceful and curved, the long cedar slopes, speckled green and gray, leading up to the bold peaks; the vast black belts of timber; the Navajo facing the sunrise with his silent prayer, the Hopi in his alfalfa fields, or the Apache along the historic Apache trail; the coyote sneaking through the arroyos; the lonely cliff dwellings with their monuments of a vanished race; the endless slopes of sage, green and gray, and purple on the heights; the smell of cedar smoke, like burning leaves in autumn; the smell of the desert, dry and

Extent.—North to south, 447 miles; east to west, 346 miles. Area, 121,666 square miles. Population (1940 census), 531,818.
Natural Features.—A vast table-land (average altitude 5,700 feet), ridged by many ranges of the Rocky Mountain system (highest point, North Truchas Peak, 13,306 feet), and isolated sierras, mesas, and buttes. Principal rivers: Rio Grande and Pecos, draining greater portion; Canadian River in northeast. Mean annual temperature, 53°; mean annual precipitation, 14".
Products.—Cattle, dairy products, sheep, wool; wheat, corn, hay, beans, cotton; copper, coal, zinc, petroleum; railroad cars, lumber.
Cities.—Albuquerque (35,449), Santa Fe (capital, 20,325), Roswell (13,482), Hobbs (10,619), Clovis (10,065).

clean and somehow new; the tangy odor of the great plateaus of cedar and juniper when your nostrils seem glued as with pitch; the sweet fragrance of the pine forests, and the indescribable and exhilarating perfume of the purple sage."

The state is a vast table-land broken by many mountain ranges. Only in the Staked Plains region is it possible to get out of sight of the mountains. The Rocky Mountains enter the state at the north and extend southeast for about 120 miles, as far as Santa Fe, in an unbroken chain of lofty peaks. The characteristic feature is the mesas, vast flat-topped hills that rise straight up from the surrounding country. Lava plateaus and other evidences of volcanic action occur in the state. The highest point is North Truchas Peak (13,306 feet) in the north central part.

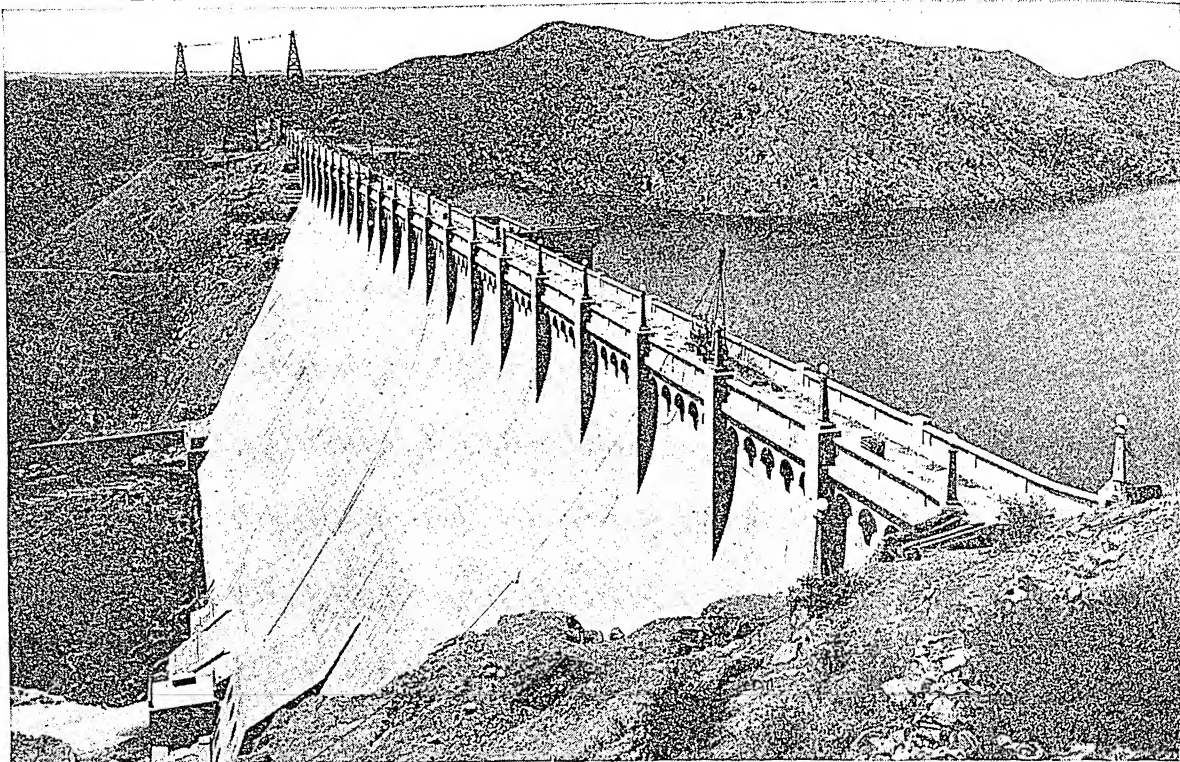
AT HOME WITH THE "PEOPLE OF THE WHITE ROCK"



The Ascoma, "People of the White Rock," have lived for centuries in this sun-baked pueblo perched on the lofty mesa of Ascoma. Legend says that their ancestors once dwelt on the Enchanted Mesa, but a great storm destroyed the only trail to the mesa top while they were cultivating their fields on the plain below. There are three parallel lines of adobe apartment houses, 1,000 feet

long and three stories high. One of the wide streets separating the dwellings provides a place for ceremonies and festivals. The Ascoma are famous for their artistic pottery, such as the jar you see above in one of the women's hands. On the pole on the upper left-hand terrace, corn is drying. The women will grind it into meal on a curved stone called a metate.

"ELEPHANT BUTTE" DAM IN THE RIO GRANDE VALLEY



When Uncle Sam had finished this magnificent piece of irrigation engineering, he had done a tremendous thing toward the transformation of the desert. This dam stores enough water to cover 2,500,000 acres a foot deep.

Among the most famous of the mesas are the superb Enchanted Mesa and its neighbor Acoma, about 50 miles west of Albuquerque. On the flat-topped summit of Acoma is an Indian pueblo, which is believed to be the oldest continuously inhabited village in the United States. It was ancient when members of Coronado's army visited it in 1540. Narrow foot trails lead to this lofty "sky city," 357 feet above the plain, but many of the Indians prefer to use the original precipitous trail which combines ladders with toe and finger holes. Every pound of mud used in building the three-story adobe houses was carried up from the plains on human backs. The Mission, established in 1629 by a Franciscan priest, Juan Ramirez, is a monument to patient endeavor. Its roof beams, 40 feet long and 14 inches square, were carried from the mountains 20 miles distant.

Acoma's 1,200 inhabitants once descended to the plains only to cultivate their fields and tend their stock. Many of them now live in the plains villages the year around, and return to Acoma only for ceremonies and festivals.

The immense arid tableland called the Staked Plains ("Llano Estacado") is in the southeastern corner of the state. In the south central part are the remarkable white gypsum sand dunes, 70 to 80 feet high, where dwell white reptiles and insects. The region is now a national monument. Capulin Mountain in the northeastern part of the state, the cinder cone of a

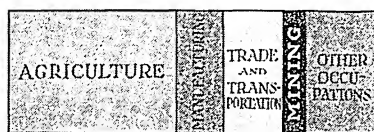
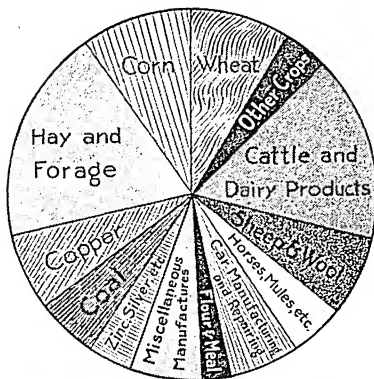
recently extinct volcano, is also a national monument. One of the largest caves in the world, the Carlsbad Caverns, has been made a national park (*see* Caves; National Parks and Monuments).

The valleys and flood plains of the New Mexican streams, when irrigated, furnish fine pasture. The salt marshes of the west center and the Rio Grande border supply the cattle ranges with salt. Sagebrush and greasewood dot the arid plateau of the northwest, more than 6,000 feet high.

Both the Rio Grande and the Pecos River are mountain streams at their sources. When the snows of the Rocky Mountains begin to melt, the Rio Grande floods the lowlands and covers them with a rich deposit of silt. In the dry season many small rivers vanish, leaving dry beds called *arroyos*.

The picturesque flowering yuccas abound everywhere. Pinyon and cedar trees are abundant in the foothills, and mesquite and the saguaro, a giant cactus, in the south. The native animals are not numerous, but include bears, deer, mountain lions, wildcats, antelopes, and coyotes. Rattlesnakes, the Gila monster, and the tarantula are common only in certain places and at certain times.

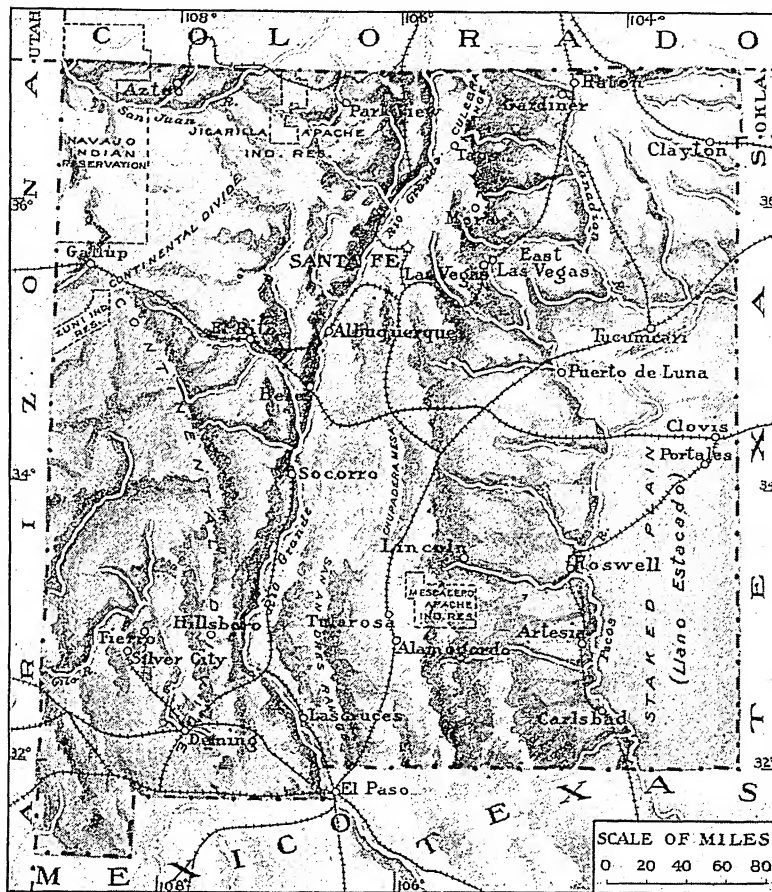
The climate, with its hot yet never oppressive summer days and always cool nights, is peculiarly healthful because of the low humidity, high altitude, and southern latitude. Plants dry up and dead bodies mummify rather than decay; wood is practically ever-

NEW MEXICO—ITS
SURFACE, PRODUCTS,
AND OCCUPATIONS

lasting and one can cure meat in the open air without salt. Except in the northwest there is a so-called wet season of about six weeks beginning early in July.

New Mexico is first of all a grazing state. The first merino sheep came into the province with the early Spanish colonists, and their descendants graze there today. The days of the "sheep kings," who numbered their sheep by the hundred thousand, are over; and cattle are now almost as numerous as sheep. Yet New Mexico is still one of the leading wool-growing states.

Corn, wheat, alfalfa, and cotton are the chief crops. Other grains, fruits, and vegetables are also grown, largely by the aid of irrigation, which had been practiced by the Pueblo Indians for centuries before white men came. More than half a million acres have



In the vast rugged rectangle covered by New Mexico, 98 Rhode Islands could be packed, for this is the fourth largest state in the Union.

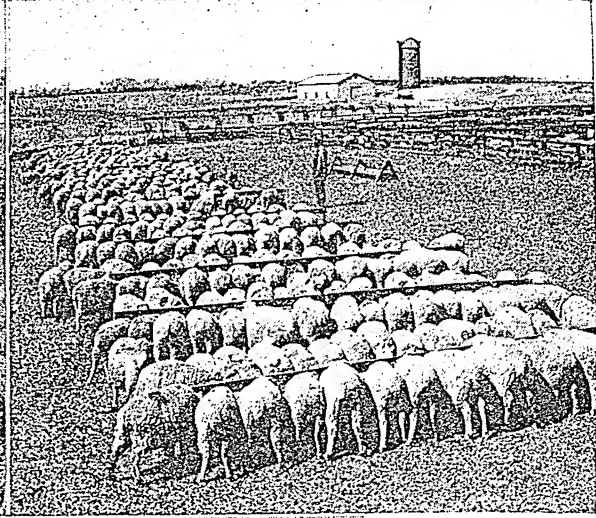
been made fit for agriculture by government and private irrigation projects. Notable among these is the huge dam at Elephant Butte in the Rio Grande valley. This submerges 40,000 acres, stores more than 2,500,000 acre-feet of water, and controls the irrigation of 155,000 acres of fertile land in New Mexico and Texas, and 25,000 acres in old Mexico. Along the Pecos valley, especially between Roswell and Carlsbad, where the government has reclaimed 25,000

VISITORS IN NEW MEXICO'S FAMOUS CARLSBAD CAVERNS



The caves near Carlsbad in southeastern New Mexico are among the largest in the world. The visitors here are standing in the vast chamber called the Palace. These caverns, occupying 16 square miles, have been made a national park.

THREE CHIEF SOURCES OF NEW MEXICO'S WEALTH



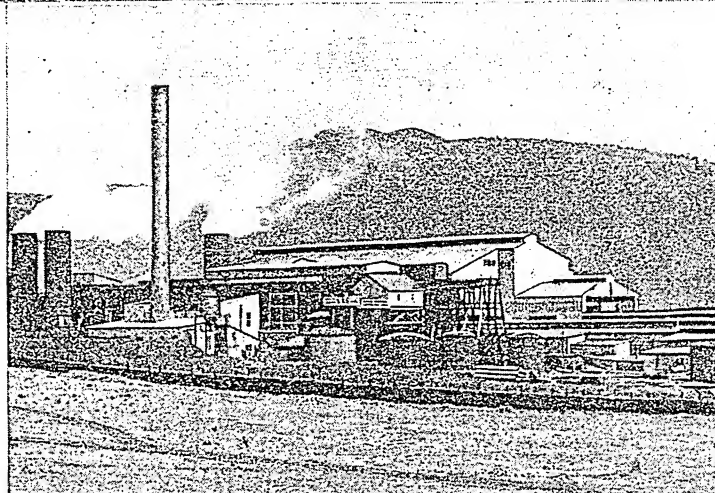
acres, and near the southern border of the state west of the Rio Grande, water from artesian wells is extensively used in irrigation.

The mineral resources are important. Silver City, in the southwest, is the center of the copper, lead, silver, and gold mining region. Coal is mined in the north. The turquoise mines were worked in Spanish times, possibly earlier. Garnets, opals, and chalcedony are

found, also soda, salt, mica, marble, tungsten, and vanadium. Much of the potash produced in the United States comes from mines in the southeast near Carlsbad.

Of the trees in the northern forests, pine is most important. The Federal government has reserved several forest tracts. In the main, New Mexico exports raw materials and imports manufactured articles. Lumber and the handwork of the Indians are among the few articles manufactured which go outside the state.

Santa Fe, the capital, founded in 1609 by Don Pedro de Peralta, is the first permanent Spanish settlement in the Southwest, the second oldest white settlement in the Union, and perhaps the most interesting city in the Southwest. Separated from Mexico by hundreds of miles of desert, it was an outpost of Spanish civilization. Set in the middle of a broad valley, with the sunset of the Sangre de Cristo Moun-



At the upper left is a heavy yield of alfalfa, a forage crop admirably suited to New Mexico. The upper right-hand picture shows feeding-time on a sheep ranch—another of the industries which thrive in the state. Below is one of the many establishments supported by the mineral wealth of the state—a concentrator, where much of the waste in ore is eliminated.

tains flaming in the west, Santa Fe was the vision which gave new life to many a worn-out, hopeless traveler. The famous old Santa Fe Trail, whose "milestones are the bones of pioneers," was an 800-mile journey from Santa Fe to the American frontier, at what is now Kansas City. The first caravan of pack animals that traversed it left Kas-kaskia, Ill., in 1804. In the following

years caravans and dust-covered prairie schooners, accompanied by the sunburned and weather-beaten emigrants and their families, pushed steadily along the trail despite the privations and dangers of the desert with its savages. In 1880 the Atchison, Topeka & Santa Fe Railroad made the old trail an iron road. Santa Fe contains many fine old historic buildings, a modern Roman Catholic cathedral, the museum of New Mexico, the state capitol, and various other state buildings. It is the seat of the School of American Research, of a government Indian school, and various other educational institutions.

Albuquerque, the largest city, was founded by the Spaniards in 1706. It is the seat of the University of New Mexico, a government school for Indians, the Harvey Indian museum, several large sanatoriums, and a number of the state's manufacturing establishments. Las Vegas (which is practically two towns, an

old Mexican settlement and a modern city) is an important wool market, the seat of the New Mexico Normal University, a manufacturing center, and a health resort. Roswell, the seat of the New Mexico Military Institute, has an oil refinery, meat-packing plant, cotton gin, flour mill, and creameries. Raton is the commercial and industrial center of a large coal-mining, grazing, and farming region. At Socorro is the state School of Mines; near Las Cruces is the College of Agriculture and Mechanic Arts; the Spanish-American Normal School is at El Rito, and the State Teachers College at Silver City.

Owing to the large Spanish-speaking population, the Spanish language still has a semiofficial status.

New Mexico was inhabited long before the day of Columbus, as the ancient pueblo ruins and cliff dwellings testify. Because of the great archeologic importance of the many ruins and remains of ancient peoples scattered through this region, the Federal government has set apart several of them as national monuments. Among these are the prehistoric pueblo or village ruins of Tabira (the so-called Gran Quivira), El Morro, the Inscription Rock, covered with Spanish records going back to 1606, and the Gila Cliff Dwellings.

The peaceful agricultural Pueblos (*see* Pueblo Indians), who dwelt here when the Spaniards came and who needed no lessons in patience, industry, and thrift from white men, still retain their picturesque costumes, their remarkable communal village organization, and their ancient tribal customs. Their one-time troublesome neighbors the Navajos, settled on a reservation which extends from Arizona into New Mexico, till the soil, and practice many primitive industries, notably the weaving of the famous Navajo blankets. The even more terrible kinsmen of the Navajos, the fierce Apaches, to escape whom the Pueblos made their dwellings on the inaccessible rocks and who were so long the scourge of the Southwest, have also been learning the ways of peace since they

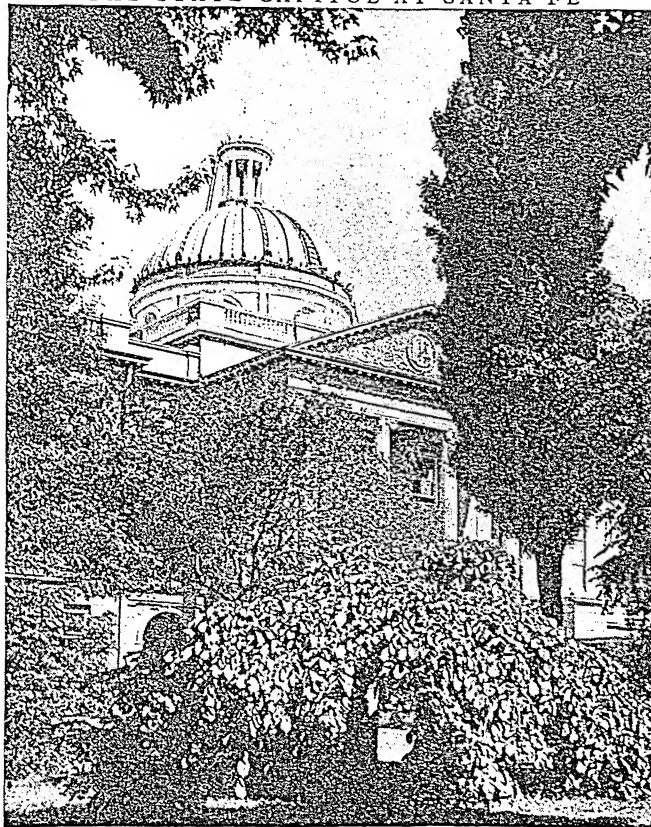
were finally subdued by Gen. Nelson A. Miles in 1886. Two Apache tribes, the Jicarillas and Mescaleros, are settled on reservations in New Mexico.

Early in the 16th century the Spaniards were attracted to the land north of Mexico by tales of cities

of fabulous wealth beyond the desert. The Franciscan friar Marcos de Niza in 1539 was the first white man who made the journey across what is now the United States border by the land route, up the Sonora valley and down the San Pedro to the Gila. Coronado followed him the next year, but failed to find the marvelous cities of which he was in quest. The first colonizer of New Mexico was a wealthy Mexican, Juan de Oñate, who with 400 colonists took possession of New Mexico in 1598. In 1609 Santa Fe was founded and made capital of the province. The Pueblo Indians long resisted Spanish rule, and in 1680 succeeded in killing or expelling all the Spaniards. Twelve years later the authority of the Mexican viceroy

was reestablished. In 1846, during the Mexican War, Gen. Stephen W. Kearny took possession of the province for the United States. New Mexico (then including Arizona) was formally ceded to the United States by the treaty of Guadalupe Hidalgo in 1848, and in 1851 the Territory of New Mexico was organized. The present southern boundary was established by the Gadsden Purchase in 1853. In 1863 the Territory of Arizona was carved off, and in 1865 New Mexico was reduced to its present limits by the annexation of a northern strip to Colorado. During the Civil War Santa Fe, in 1862, was occupied successively by Confederate and Federal forces. In 1863, after the Confederates had been forced back into Texas, the Union troops compelled the Navajos to accept life within a reservation. The Apaches proved more troublesome, and broke out in many raids. The last was in 1885-86, when the capture of their chief, Geronimo, ended their war-making. New Mexico was admitted to the Union as a state in 1912, after many unsuccessful previous efforts.

THE STATE CAPITOL AT SANTA FE



We are looking up at the dome of the state Capitol at Santa Fe. It is an attractive building of brick and stone, set in beautiful surroundings.

The QUEEN CITY of the SOUTH

NEW ORLEANS, LA. The gateway to the Mississippi Valley with Latin America just across the Gulf of Mexico and the markets of Asia accessible through the Panama Canal, New Orleans is destined to be one of the great shipping centers of the world. The "Queen City of the Gulf" is 600 miles or more nearer than New York to all the ports of Central America and to all the Pacific ports of South America. Though New York is nearer to Venezuela, Brazil, Uruguay, and Argentina, New Orleans still has important advantages for commerce with these four countries by virtue of the fact that it has a shorter rail haul to some of the great industrial and producing centers of the United States. It is not so near as New York to Europe, but it is 585 miles nearer to Yokohama, Hong Kong, Manila, and Singapore. It is the point of transfer between ocean steamers and the river barges which tap the vast territory between the Alleghenies and the Rockies.

Built originally along a great bend of the Mississippi, 107 miles above its mouth, with streets that curved to follow the river, New Orleans was given the name of "the Crescent City." But it long ago outgrew this shape, as it gradually made its way back to Lake Borgne and Lake Pontchartrain. It has one of the safest harbors in the world, and a double outlet to the sea. The longer route is down the Mississippi; the

other route, only about half as long, is by way of the Inner Harbor Navigation Canal, completed in 1923. The canal extends $5\frac{1}{2}$ miles from the river across the city to Lake Pontchartrain, which opens on the Gulf. A lock at the river end keeps the canal at lake level and protects it from spring floods. The canal provides deep-water frontage for extensive industrial development.

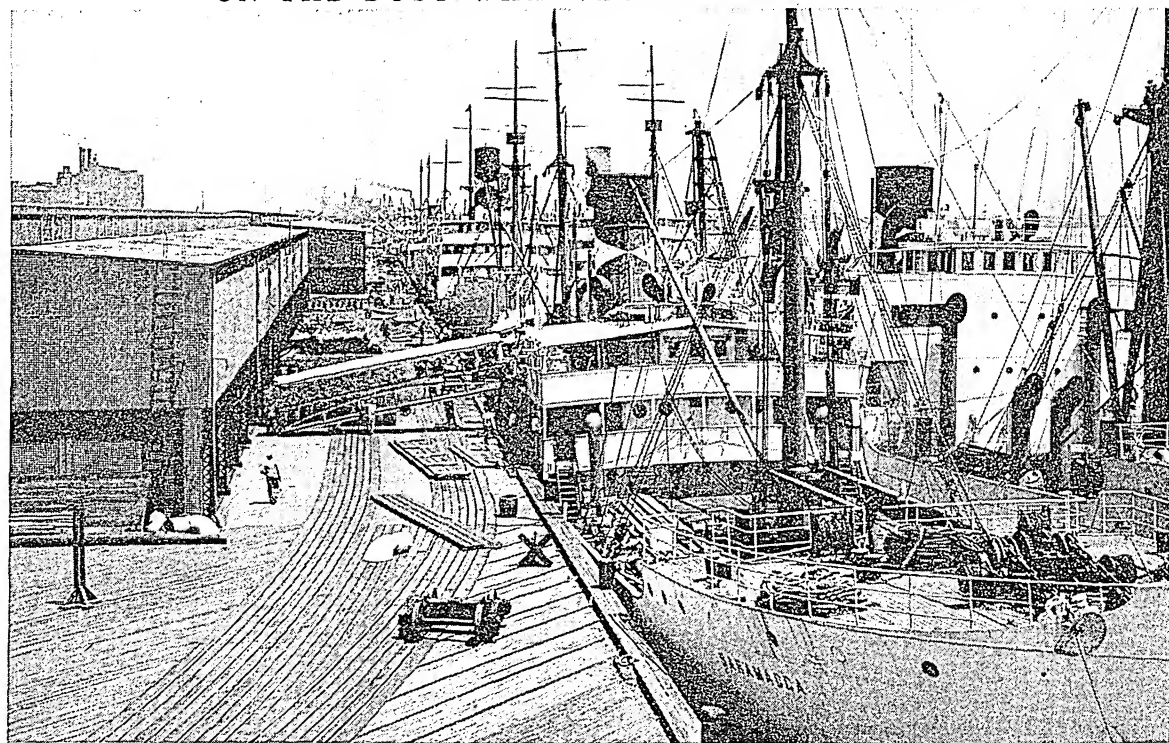
Transportation by Water, Rail, and Air

About 90 steamship lines and a dozen railroads serve the city. A municipally owned belt railroad gives all rail lines equal access to the port facilities. The \$13,500,000 Huey P. Long Bridge across the Mississippi River, opened in 1935, is a unit of the belt railroad. A great airport on Lake Pontchartrain handles a growing volume of air traffic.

The harbor frontage is equipped with about seven miles of wharves and warehouses, owned by the city. The grain elevator, the cotton warehouse, the bulk commodity handling plant for coal, sulphur, and ores, the vegetable oil pumping plant, and the coffee terminal are among the largest in the world. Great dry docks are at the service of the steamship companies for repairs.

New Orleans is the greatest market in the world for cotton, molasses, rice, and burlaps, and the largest in the South for sugar and coffee. It ships great

ON THE BUSY WHARVES OF NEW ORLEANS

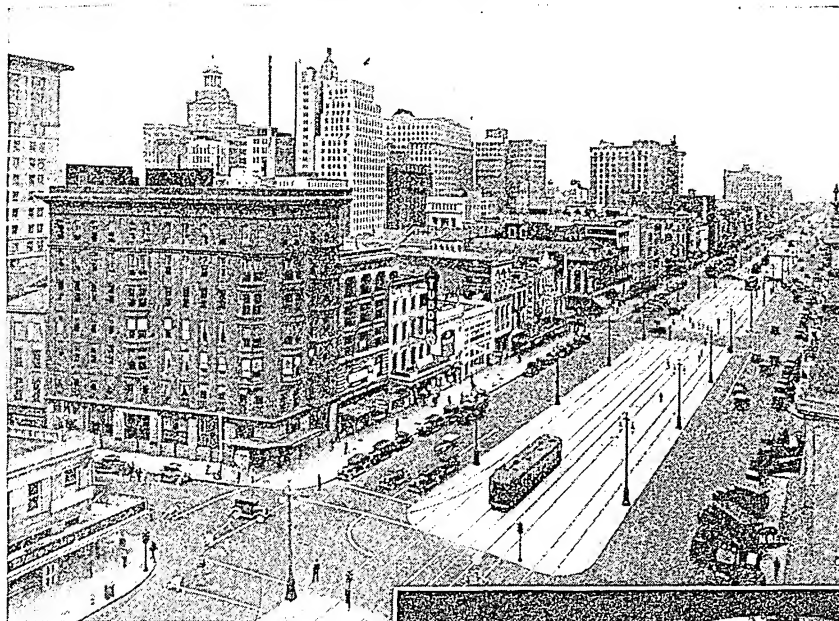


You see how perfectly everything is arranged here. The ships come right up alongside the wharves and are unloaded directly into the great steel warehouses. Tracks run along the wharves to carry freight away from these warehouses or bring it to them for transfer to outgoing vessels. New Orleans has 41 miles of harbor frontage on both sides of the Mississippi River and 11 miles on the Inner Harbor Navigation Canal, much of which is equipped with modern freight-handling facilities.

quantities of petroleum, lumber, and cottonseed-oil—all produced in Louisiana—and southern and Mexican wool is shipped through in quantities to northern mills. Vast grain warehouses testify to the extent of its export commerce in wheat, corn, and

New Orleans proper lies on the east side of the river; but both banks are lined with wharves and warehouses, and in the season that follows the harvests of the West and South these are filled with the raw staples of those regions. Mile after mile of great

GLIMPSES OF NEW ORLEANS, OLD AND NEW



The upper picture shows some of New Orleans' stores and office buildings along Canal Street, the axis of the city. This street runs north and south and divides the city sharply into two parts—the French quarter to the east, and the modern portion to the west. You can judge the street's tremendous width by noticing that even with four car tracks, it has ample roadways for automobiles. The lower picture shows a characteristic patio in the older section of the city, now used as a public restaurant.

other cereals. A constant stream of products too numerous to mention constantly flows in from foreign ports, including shipload upon shipload of bananas from Central American ports.

Manufactures and Industries

New Orleans is also one of the greatest manufacturing cities in the South. The largest mahogany plant in the world is situated there, and the largest sugar refinery is just outside the city. Hundreds of different products are turned out by its great factories, including boxes, burlap bags, canned goods, candy, clothing, furniture, cotton goods, cottonseed-oil, paints, drugs, sugar, molasses, and various food products. Among the leading industries are rice milling, oil refining, coffee roasting, sugar refining, lumber manufactures, and the manufacture of wall board from sugar-cane refuse.

"levees" or dikes bar the rising waters of the Mississippi from the city, which lies below the river's level. As added protection the Bonnet Carré Spillway, 35 miles upstream, completed in 1935, carries flood waters into Lake Pontchartrain. Parallel to the levees on both sides of the river are the markets and the freight houses. In the city proper the business section flanks the markets, and tall buildings lift their shafts to the sky. Northward and southward lie factories. The modern residence district, lying farther back from the river-front, away from the clinging smoke of the fac-



tories, denotes the prosperity of the city. The large and costly dwellings set in the midst of spacious lawns of emerald green, the broad palm-bordered streets, the extensive well-kept parks, contrast strangely with old New Orleans, the city of

THE LARGEST COTTON WAREHOUSE IN THE WORLD

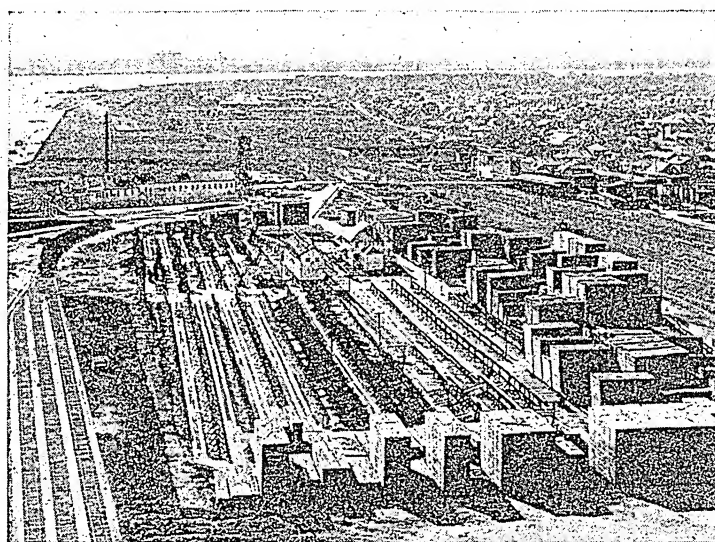


New Orleans shares with Galveston the honor of being the greatest of cotton shipping ports, and this, the largest of all cotton warehouses, was built to take care of this immense traffic.

American-born French and Spanish (Creoles), who still cling to the speech and customs of their ancestors.

This old French quarter is in reality a city in itself, little touched by the tide of industry that has created the modern metropolis. It lies hemmed in by the smoking factories, the rambling warehouses, and busy section of the city of today. The narrow flagstone-paved streets run between crowded rows of quaint old

dwellings erected more than a century ago, and patterned after the houses of southern France, Spain, and Italy. Heavy iron-bound doors open abruptly on the uneven sidewalks, and through clinging vines of roses and ivy that clamber over the great gates one catches glimpses of fine old courtyards with time-scarred fountains and statues, crumbling pavements, and a riot of tropical greenery. Hanging over the courtyards are pretty balconies with railings of beautifully wrought iron. Within these ancient mansions dwell in quiet dignity the old Creole families, whose histories date back to the earlier days of New Orleans. They watch with patient resignation the inroads that American progress makes on their picturesque habitations. Even the twisted streets, named for old French and Spanish governors, recall the romantic days of the 18th century. The old market place is still a reminder of a vanished past; and of



New Orleans also has the largest mahogany distributing plant in the world. The mahogany logs come from Central and South America, and the saws of this mill cut them up into the lumber which you see stacked in those piles.

an early morning, when crowded with people haggling over their wares, it presents a pleasing picture. Ebony-skinned negroes bear round baskets atop of their kinky heads, easily balancing their loads of fruits and vegetables as they make their way across the uneven stones. Bright-hued sunbonnets, hiding the faces of dusky wearers, add a wealth of color to the scene. The beauty and romance of the whole

Latin quarter have made it the Mecca of travelers and the theme of stories, and the tourist as well as the old French and Spanish families truly sorrows as the wheels of commerce relentlessly crush down the old and fascinating, to place in its stead the modern and utilitarian. The old walls that formerly marked the city's boundaries are now wide tree-lined avenues; and the old "commons" or *Place d'Armes*, with which was associated nearly every important historic event of Louisiana, is now a neatly laid-out stretch of flowerbeds, white shell walks, and shaven shrubbery, known as Jackson Square. But this city, in which history, poetry, and romance are so indissolubly united, still retains something of its old-time charm. The yearly Mardi Gras carnival, a heritage of the Latin Old World to its faithful children of the New, has done much to keep the spirit of the past alive. It is a season looked forward to by young and old

alike, and visitors from all over the country come to join in the festivities.

New Orleans is the seat of Tulane University and its branch for women, Newcomb College. The Louisiana State University schools of medicine, dentistry, and pharmacy, Loyola University, and the Delgado Trades School for boys are also here.

City Park contains the Delgado Museum of Fine Arts, and the ancient "dueling oaks" under which affairs of honor were once settled. A short drive brings one to the Bayou Teche country, land of Longfellow's Evangeline; Bayou Barataria, picturesque haunt of the pirates, Jean and Pierre Lafitte; and Chalmette, where the Battle of New Orleans was fought in 1815.

The Story of Over Two Centuries

New Orleans was founded in 1718 by Jean Baptiste Lemoyne, Sieur de Bienville. In 1722 it was made the capital of the great Louisiana territory, and became the center of industrial and political importance in the French territory. In 1762, however, at the end of the Seven Years' War, France ceded her territories west of the Mississippi, including New Orleans, to her ally Spain. The city remained under Spanish rule until Napoleon in 1800 forced Spain by a secret treaty to restore the Louisiana territory to France. A fire in 1788 destroyed a large portion of the city, after which it took on a new and better growth.

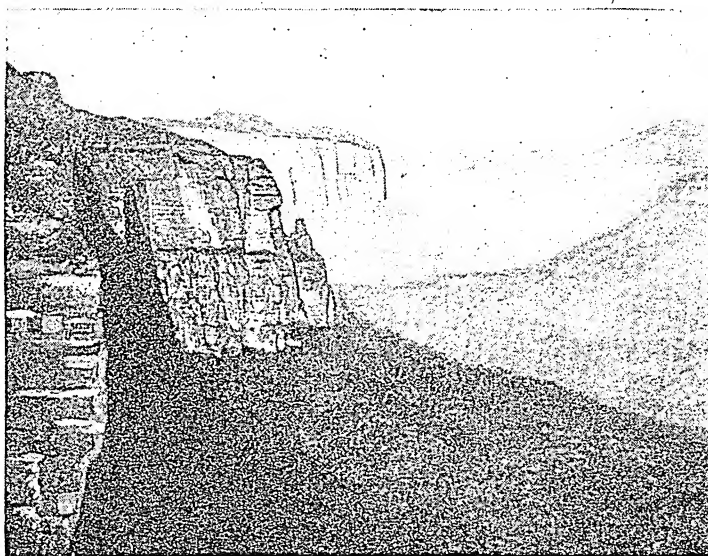
Shortly after France took formal possession in 1803 the United States bought the Louisiana territory (*see Louisiana; Louisiana Purchase*). At that time the city's population was less than 10,000, mostly French Creoles and their slaves. Meanwhile the growth of flatboat commerce on the Mississippi had given impetus to New Orleans' trade, and when the first steamboat reached the city from Pittsburgh in 1812, its prosperity was assured. At various times it was the state capital, until the constitution of 1879 established Baton Rouge as the capital. In the Civil War it was an important Federal strategic point after its capture by Farragut in 1862. The war paralyzed the city's commerce, and it was not until the '70's that it regained its former footing. Epidemics of yellow fever, long the scourge of New Orleans, were ended (1878-1906) when the United States Marine Hospital Service took charge and abolished the breeding places of the mosquitoes which carried the plague. Similarly a campaign of the United States Health Service in 1914, directed against rats, the carriers of bubonic plague, destroyed many unsanitary structures. In 1927 New Orleans, to save itself from Mississippi floods, had to divert the waters upon two parishes to the southeast of the city and to provide new homes for the inhabitants thus driven from their land. Population (1940 census), 494,537.

NEW SOUTH WALES, AUSTRALIA. The oldest and most populous British colony in Australia is now an original state of the Australian Commonwealth. It has an area of 309,432 square miles—about twice the size of California—with a population of about 2,600,000. A large part of the land is devoted to sheep- and cattle-raising, since little of it is sufficiently watered for farming. Wheat is the chief crop grown, and wool is the chief export. The coal fields are the chief source of mineral wealth. In the production of coal, as well as of silver-lead ore, New South Wales leads the states of the Australian Commonwealth. Silver, gold, tin, zinc, and other minerals are also mined.

There are forests of eucalyptus and other trees, and timber is an important export. New South Wales on account of its harbors and resources has the largest trade of any of the Australian states. The state government owns many public utilities, and provides old-age and widows' pensions and special relief for poor families. The school system is headed by the University of Sydney. The chief cities are Sydney (capital), Newcastle, and Broken Hill.

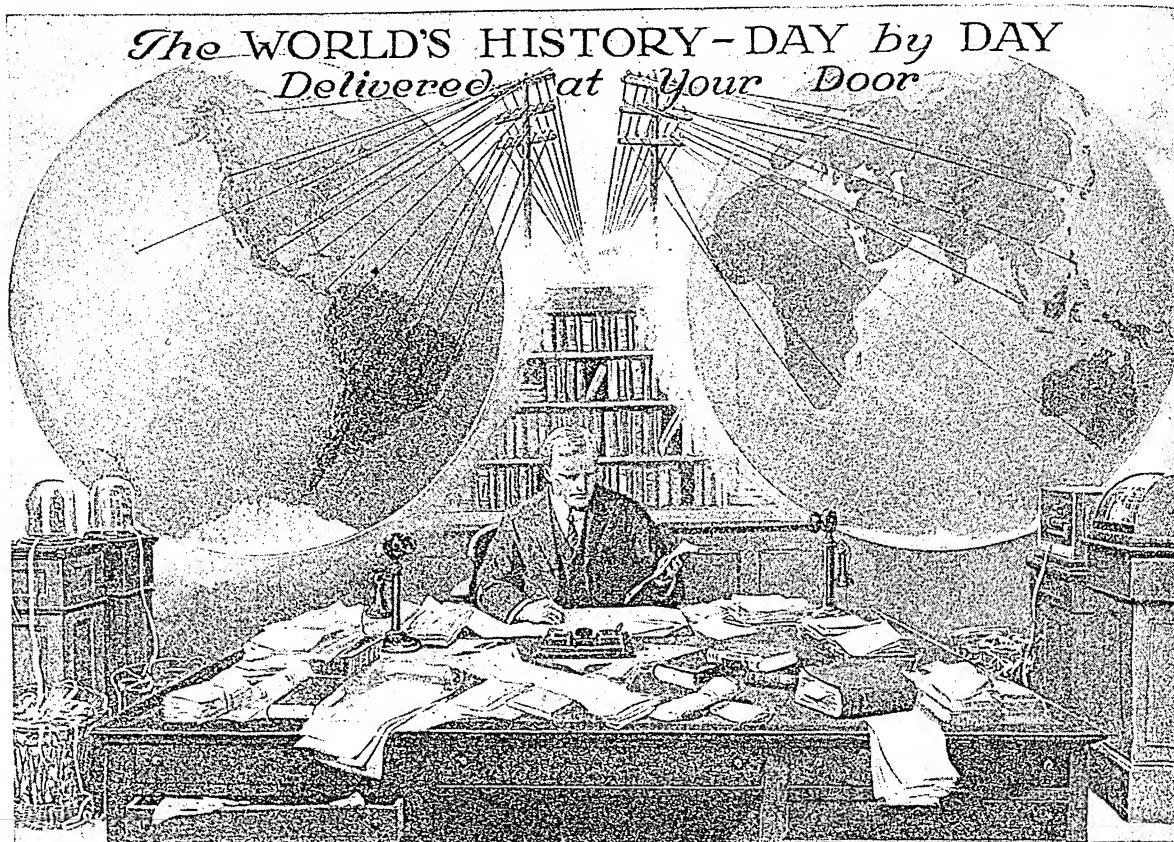
New South Wales shares the characteristic formation of eastern Australia—that of a narrow coastal plain, backed by the Great Dividing Range of mountains about 100 miles inland. The rapidly changing levels give the state a great diversity of

A GLIMPSE OF THE "BLUE MOUNTAINS"



This beautiful valley is typical of the scenery to be found in the great mountain range which skirts the whole eastern coast of Australia and forms the backbone of New South Wales. These mountains are rich in mineral wealth.

climate, from Sydney's mean temperature of 63° at the seacoast to inland temperatures ranging as high as 130°. The difference between average summer and winter temperatures at Sydney is 17°. Rainfall varies from 64 inches a year in one district in the south to 32.5 inches on the table-lands and 10 inches in the west. (*See Australia.*)



NEWSPAPERS. Let us join a personally conducted tour through one of the most wonderful of modern industrial beehives, a newspaper plant. Let us watch the workings of the amazing organization that brings to you every morning and almost hour by hour through the day the news of every important happening from Alaska to Patagonia, from New York to far-away China.

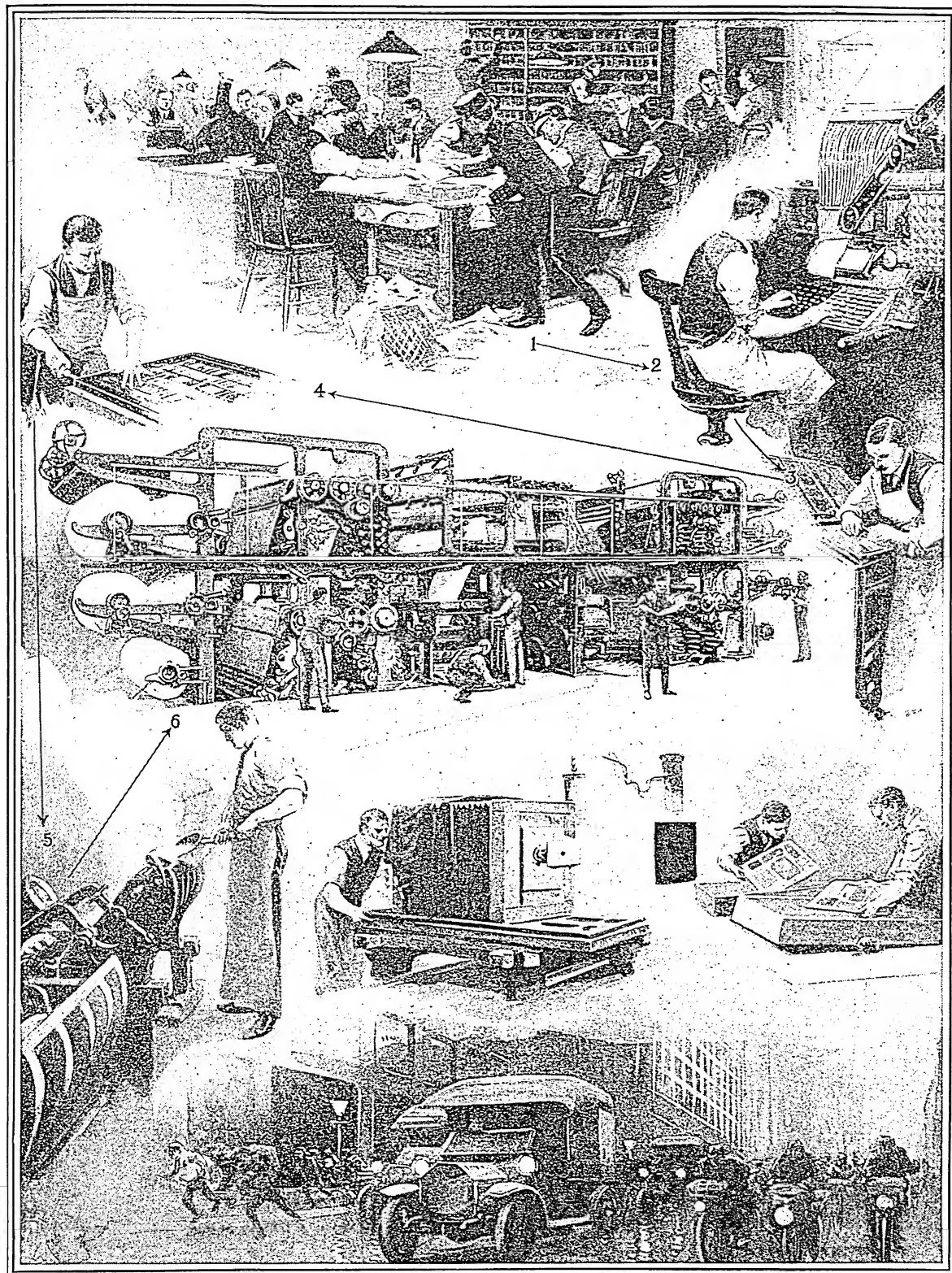
We enter a doorway marked "editorial department" and find ourselves immediately in the midst of uproar and hubbub. Men are shouting orders, boys dashing hither and thither, typewriters clicking at top speed, telephones ringing, telegraph instruments tapping off messages from all over the world, editors working over copy with feverish energy. But everybody in the room, from managing editor to office boy, is at his appointed task, each one a cog in a machine of marvelous precision.

A reporter calls up the office with an important "story" which must make the edition to be on the news-stands in half an hour. Fast as his fingers can fly, a "rewrite man," with a telephone clamped to his ear, dashes the story off on a typewriter—a few lines to a sheet. A boy rushes each sheet of copy to the city editor, who examines it quickly and passes it to the copy desk. Here it is carefully edited, a headline is written, and then it is shot through a pneumatic tube to the composing room.

Here begin the mechanical processes. We watch the copy-cutter cut each sheet of copy into two or more "takes," hang them on a hook, and apportion them among the compositors operating linotype machines (*see* Linotype). Nearly as fast as the words come from the typewriter these wonderful devices cast them into lines of solid type, which are rushed through a proof press and then speeded to the forms—large metal frames the size of a page—where the makeup man places them, still almost too hot to touch, in the space reserved for them among the columns of type already set.

All these operations have required only a few minutes. We now watch the makeup man "lock up" the form and speed it on a small truck to the steam table where a sheet of papier-mâché is pressed upon the page of type, so that it takes the impression of every letter. This papier-mâché mold is dropped through a chute to the stereotyping room, where it goes into the "casting box," and within three minutes a semicylindrical plate—an exact reproduction of the original form of type, except that it is curved to fit the presses, is cast from it (*see* Stereotyping). The plate—still so hot it cannot be handled without gloves—is hurried to the press-room, where it is placed on one of the cylinders of the gigantic mechanism, with the plates of the other pages already in place. A signal is given. Grimy pressman leap to safety, and

HOW YOU GET YOUR DAILY NEWS OF THE WORLD



From the Editorial Room (1), where the "stories" are prepared, the copy goes to the Linotype Machines (2) to be set in type. When the type and headlines are assembled (3) they are "made up" in page forms (4). Papier-mâché "mats" or molds taken from the forms are sent to the Stereotyping Room (5), where metal plates are cast. As soon as all the plates have been put in place the great presses (6) are started and papers begin pouring out, to be rushed to all parts of the city by trucks, motorcycles, and newsboys. The other pictures show cuts being made in the Photo-engraving Department.

the huge mass of delicate machinery starts. At one end we see an enormous roll of white paper—five miles of it. At lightning speed the paper is fed into the press. And far too fast for the eye to count them—300,000 an hour in the most modern plants with a battery of presses—our completed newspapers, cut and folded, just as they come to us, leap forth at the other end. (See Printing.)

Endless belts whirl the papers out to the distributing and mailing rooms. Chugging automobiles are piled high and rush at breakneck speed to delivery stations throughout the city. Other automobiles dash to make fast mail trains for distant points, while dozens of newsboys seize their quotas and hurry to the street to shout the news of some great man's death, an important political development, or a terrible tragedy half an hour after it has happened.

Still more astonishing to the uninitiated is the device by which news that is received within the last few minutes before press time is printed in the form of brief bulletins on the first page. This device is called the "fudge-box." A space of any desired size, usually two columns wide, is left blank on the stereotype plate. Exactly corresponding to this blank space on another cylinder is an arrangement into which type can quickly be fitted and clamped in place. Suppose a baseball game is in progress. A reporter in the press box beside a telegraph operator or a telephone reports each play as it is made. Another man in the fudge room of the newspaper office repeats the plays to the operator of the fudge linotype, so that each play is recorded on the metal slugs even before the applause in the grandstand has died down. Perhaps 30 seconds before the giant press is started, the type thus set is rushed to the special fudge cylinder and clamped directly in place without the necessity of casting a plate from it. Thus it often happens that the newsboys are shouting the result of a ball game on the streets before half the crowd has left the park.

Vast Expenses of a Great Newspaper

Such speed is possible only because a modern metropolitan newspaper is one of the most efficiently organized industries in the world. Besides professional newspaper men—editors, copy readers, and reporters—masters of at least half a dozen highly skilled crafts are required in its production. The amount of money represented by a newspaper plant and the cost of production are enormous. The two or three cents which you pay for your copy does not pay for the white paper alone.

Three mechanical factors have made their influence most keenly felt in producing the modern newspaper. They are: (1) the development of the printing press; (2) the invention of the linotype, the monotype, and allied devices; and (3) the invention of the telephone, the telegraph, and wireless telegraphy. The first two of these factors made great speed of production and enormous volume of product possible. The third annihilated time and distance and made it possible to assemble the news of the world overnight.

Although there are many newspapers in Europe and elsewhere which "cover" the news of the world comprehensively, the dailies of the great cities of the United States undoubtedly offer the most highly developed examples of modern journalism. This is due not only to the completeness of their mechanical equipment, but also to their enterprise, engendered by keen competition, which causes them to go to any expense to score a "beat" or "scoop" on their rivals.

How New Our Newspapers Are

Nearly all the great strides in newspaper-making have come in the last hundred years. It was not such a far cry from the *Acta Diurna* ("Daily Events") of ancient Rome—short bulletins of battles, fires, elections, etc., compiled by government officials and posted up in public places—to the official *Notizie Scritte* which the government of Venice issued in the 16th century. This was a hand-written bulletin, and the written journal persisted long after the use of printing began, largely because government censors kept a close watch on printed newspapers. About the same time private presses in other cities of Europe began issuing news-letters from time to time reporting the most remarkable events of the time. In 1615 the news-letter developed into the first regular weekly newspaper, the German *Frankfurter Journal*. The first regular newspaper in England was the *Weekly News*, started in London in 1622. The freedom of the press from censorship before printing came first in England in 1695, and marked a great forward step in the history of newspapers. Boston was the home of the first American newspaper, *Public Occurrences* (1690), which was speedily suppressed by the governor of Massachusetts. Next came the *News-Letter* (1704) and the *Gazette* (1719), also published in Boston. In 1729 Benjamin Franklin started the weekly *Pennsylvania Gazette* at Philadelphia, later merged with the *North American*, which was for a century and a half one of the leading papers of the United States.

The First Daily Newspapers

The first daily newspaper in America, the *American Daily Advertiser*, was started in Philadelphia in 1774. Next came the *New York Daily Advertiser*, in 1785. During the Revolutionary War period, more than 30 papers appeared more or less regularly in various sections. The *New York Evening Post*, founded in 1801 by Alexander Hamilton, John Jay, and associates, was edited by William Cullen Bryant for nearly 50 years, from 1829 to 1878. Carl Schurz held the same post for five years.

The early newspapers set forth chiefly political and other opinions of the editors and their friends, their party, or their financial backers. Editors depended largely upon subscribers to send news. The *New York Sun*, founded in 1833, was the first newspaper to gather news systematically. James Gordon Bennett developed that policy as editor of the *New York Herald*, started in 1835. For many years the *Herald* was one of the world's best known newspapers, with a Paris edition produced in the French capital. Bennett

stressed foreign news, and introduced financial, dramatic, musical, club, and society columns into the pages of his daily paper.

Development of the telegraph and the railroad more than doubled the circulation of American newspapers between 1840 and 1850. As the frontier advanced in the west, papers sprang up in new settlements. Some of them continue today. The *Detroit Free Press* was launched in 1835; the *Chicago Tribune* in 1847; in St. Louis, the *Post-Dispatch* started in 1851 and the *Globe-Democrat* in 1852.

A Million Copies a Day

In 1875, an American newspaper with a sale of 50,000 was remarkable. In recent years, however, one New York newspaper has sold over 1,700,000 copies daily and more than 3,000,000 on Sunday. Two Chicago newspapers have each sold approximately 1,000,000 copies of their Sunday editions.

The average daily circulation of newspapers in the United States has passed 40,000,000, and that of Sunday papers has exceeded 29,000,000. Weekly papers have circulated over 15,000,000. There have been more than 2,200 daily and 11,000 weekly publications in the United States at one time. Many are printed in foreign languages, especially in the great cities and other areas of large foreign population.

Advertising is the life-blood of a newspaper, and since advertising rates are based on circulation, there is a constant battle for circulation. In this struggle many papers have been absorbed by stronger rivals. Newspaper circulation is limited largely to certain areas, and the fewer the papers in each area, the better chance each has for more sales.

Importance of Advertising

Income of American newspapers for a typical year has exceeded \$1,000,000,000. Almost three-fourths of this amount comes from advertising; and the remainder from circulation. Newspapers have large well organized advertising departments, which are ever alert to sell advertising space. Batteries of telephone operators accept "ads" by telephone, and sometimes even solicit advertising by wire. Large newspapers also maintain advertising staffs in many of the chief cities of the country and in the principal capitals of Europe.

Almost any advertising was accepted by early newspapers. Now reputable papers guard their advertising columns. Doubtful advertising is investigated and false or misleading "ads" are rejected. Many newspapers refuse to accept certain classes of "ads."

Newspaper advertising, like circulation, has territorial limits. Department store advertising is an important source of income in large cities, as are the small "classified advertising columns," such as the "help wanted," and "real estate," "ads," but these have purely a local field. National advertising of products sold all over the country appears often in many papers at the same time and is of growing importance in the newspaper field. (See Advertising.)

Many newspapers maintain extensive "promotional staffs" for the benefit of advertisers. Experts study a

product and the prospects for its sale, and advise and sometimes even plan a campaign by which the public is to be told of the product.

How the "Chains" Work

The large capital needed for newspapers has brought the "chain" newspaper. More than 50 "chains" have controlled over 300 papers at one time. All papers of a chain use the same feature articles, such as brief articles on health, short stories, answers to questions, and humorous articles; and they also use the same cartoons, special foreign articles, and the services of one of the great news-gathering organizations, such as the Associated Press, United Press, or International News Service. Each one prints the city and state news in its territory, as well as local advertising. National advertising often is placed with a chain for insertion in several or all the papers it controls.

Financing of newspapers by issues of stock and bonds is replacing individual ownership by one man or one family. Criticism is raised whenever large commercial interests secure financial control of a paper; there is the fear that they may seek to influence public opinion unduly through propaganda, or partisan statements, published in the papers. The term "subsidized press" has been applied to papers so controlled. A paper also is said to be subsidized if it permits advertisers to dictate its editorial policies.

The Problem of Propaganda

To indicate their good faith, many newspapers state on the editorial page their "platforms," that is, the chief principles they advocate; and also place "by-lines" stating the names of writers over all articles which advance the interests of a particular cause. Some newspapers try to present both sides of controversial subjects, by printing articles supplied by advocates of the opposing views. Nearly all open their columns to letters representing all shades of opinion. Nearly all subscribe to the principle that news should be reported fairly and accurately, without "editorializing" in the news columns.

White paper is such an important item with the present tremendous circulations that some papers now own forests, paper mills, short railroad lines, and steamships, which produce and transport their paper.

In New York and Chicago, some papers in order to save time in distribution, have installed branch printing plants in distant neighborhoods or in suburbs. Matrices or plates are rushed from the main office to these plants, where the papers are printed and quickly put on the streets.

Recent Rise of the "Tabloids"

The "tabloid" or "picture-paper," usually about half the size of a regular newspaper, tries to tell most of the news with pictures. The first successful tabloid in America, started in New York in 1919, was patterned after the prosperous *London Mirror*. The popularity of "picture-papers" soon influenced even more conservative newspapers to print more pictures.

Millions of newspaper readers, old and young, eagerly follow "feature" material, such as fiction in

the form of short stories or serials, columns of household advice, fashions, chatter about persons and events, humor, personal opinion, and the popular "funnies" or comic strips. Most of these are sold by syndicates to many newspapers, which publish them on the same day, and so they are called "syndicated features." Famous writers and artists can thus be paid large salaries. Notable persons frequently contribute to this important phase of present-day journalism. Former President Coolidge, for example, wrote a series of short daily articles for publication in scores of newspapers.

Comic Strips and Cartoons

Artists of wide reputation draw daily comic strips and cartoons. The joys and the griefs, the pranks and the adventures of famous line-and-color figures, such as R. F. Outcault's "Buster Brown," "Bud" Fisher's "Mutt and Jeff," George Herriman's "Krazy Kat," Sidney Smith's "Andy Gump," and many others have delighted readers of all ages. Some editors believe that the "features" have the greatest drawing power both to secure and to hold readers.

Successful papers now provide many special services for readers as well as for advertisers. An information department may give out data of almost any sort, from information concerning schools, vacation resorts, ocean or railroad travel, to the latest reports concerning the condition of automobile roads. Many have a department to advise small investors; some maintain income tax bureaus in proper season to help the taxpayer make out his return.

The importance of the newspaper has been recognized universally. Indeed, it was called by Macaulay "the Fourth Estate"—more important, as Edmund Burke once exclaimed, pointing to the reporters' gallery in the English House of Commons, than the original "three estates," the clergy, the nobles, and the freemen. The press is usually held to be the most effective single factor in shaping public opinion.

Value of Newspaper Reading

Teachers of history and sociology emphasize the value of the regular reading of newspapers by students. They point out the importance of current news articles as helps in the study of the social, economic, and political trends of the day. Controversy has arisen regarding the good or the harm that is done by the printing of so-called "sensational" news stories, especially those that give details of crime. Editors differ widely in the extent to which they present crime news and in the way they handle such material. Some students of society hold that crime news should be almost entirely omitted, believing such publicity tends to increase crime. Most editors believe that it should receive adequate attention, so that the public may be stirred to rebel against the causes of crime or its toleration by corrupt officials.

High schools, colleges, and universities now offer courses, either in special departments or in schools of journalism, to train writers and editors. Many of these have experienced newspaper men in charge.

The college-trained man and woman are sought, not only for reportorial and other editorial positions, but also for the business and advertising departments. They are now generally preferred to the unschooled "rough-and-ready" newspaper type of earlier days.

Newspaper Work as a Career

Journalism as a career has been the subject of much debate. Newspaper work undoubtedly has a lure that brings to classes in journalism many who are not suited to the work. Many students look upon newspaper work as a stepping-stone to other careers. Many authors and playwrights have started with newspapers; but it is equally true that many more have come from far different walks of life—from the law office, the store, the doctor's office, the scientist's laboratory, and the ship at sea. Many successful writers never were inside a newspaper office.

Newspaper salaries are not large, except for so-called "stars," editors, and executives. The man or woman assigned to Washington as special correspondent has about reached the top in the profession, yet the salaries of these special correspondents often do not compare with salaries of leaders in many business fields. The foreign correspondent ranks about with the Washington reporters in importance and in salary. Any such post requires first a thorough knowledge of what constitutes news, with an ability to write accurately, clearly, simply, and tersely. But tact, diplomacy, and an ability to keep on favorable terms even with those hostile to his paper are just as important. This ability is not a "gift" as is commonly believed. It may be developed, if one has a liking for writing, after stern self-disciplining in the use of the right word and the laws of effective writing. (*See Writing.*)

An increasing number of women are finding success in newspaper work. In addition to reportorial work, many have specialized in writing articles or columns on fashion, society, and on household or art topics.

The modern American newspaper is divided into five departments. They are the editorial, circulation, business, advertising, and mechanical. The principal executives are the publisher, who is usually the proprietor and editor-in-chief; the business manager; the managing editor and the advertising manager. Each department chief is responsible for the smooth and orderly working of his department, and the activities of all the departments must dovetail together with clocklike precision.

News Gathering and Editing

The editorial staff is headed by the managing editor, who is in direct charge of gathering, editing, and publishing the news. Coöperating immediately with the managing editor are the city editor, the telegraph editor, the news editor, and the make-up editor. The reporters, divided into "general assignment" men and those who cover certain "runs" such as the courts, City Hall, police station, etc., work directly under the city editor and his assistant. Everything written for the newspaper, including telegraph and local news, financial news, "feature" articles, musical and dra-

matic items, and correspondence, must go through the hands of sub-editors, or copy readers, who prepare the copy for the printer, correct it, "trim" it to allotted space, eliminate mistakes, and write the headlines.

The telegraph editor has charge of editing all news that comes into the office over the wires. On a few of the largest newspapers a foreign editor is in charge of his own paper's foreign service and all foreign news gathered by other agencies. Several copy readers usually assist the telegraph editor, who is known commonly as "head of the telegraph desk." The makeup editor supervises the arrangement of type in forms in the composing room. With the managing editor, the news editor, and the city editor, he determines in what column and on what page each important article is to appear, and helps to decide what to "play up" and to "play down." Frequently news stories are given prominence rather because they conform to the political or business policy of a newspaper than because of their intrinsic importance or interest. Sporting news is gathered by the sporting editor and his assistants, who are usually recognized experts in various lines of sport. In like manner musical, dramatic, and financial news is written by men or women who make a specialty of these lines.

Coöperative News Bureaus

In the larger cities the newspapers usually form a coöperative bureau to cover all routine news. This is mimeographed and sent to all newspaper offices simultaneously through pneumatic tubes. So thoroughly organized is the business of gathering news that scarcely anything of importance can happen in a large city without the newspapers becoming aware of it. Trained reporters develop an uncanny "nose for news" which enables them to ferret out information despite the most strenuous efforts to conceal facts; and frequently this quality, together with a broad acquaintance, enables them to score "scoops," or exclusive stories. To achieve this the good reporter will perform prodigies of labor, sometimes at the risk of life and limb.

Most large American newspapers maintain a staff in Washington, sometimes as many as half a dozen of their best reporters. This is a coveted post; but the position the reporter prizes most is that of foreign correspondent. Some American newspapers have men stationed in all the important capitals of Europe, South and Central America, and Asia. Some have a dozen or more such bureaus, each with a "star" reporter in charge of a staff. Smaller papers of course cannot afford such expense, so for their foreign news and perhaps for news from Washington, New York, and other important centers, they depend upon one or more of the great news-gathering agencies.

There are in the United States three large news-gathering agencies which cover the world with a fine-tooth comb and supply all the important newspapers with telegraph and foreign news. The greatest of these is the Associated Press, a coöperative association comprising about 1,400 newspapers. Its

correspondents are everywhere, even in the most remote parts of the world. Its great web of more than 280,000 miles of telegraph wire reaches into every corner of the United States. An average of 100,000 words—enough to fill 100 columns—is received daily by the larger "A. P." offices. The Associated Press, a non-profit enterprise, is supported by membership fees. Other great news-gathering agencies in the United States are the International News Service and the United Press. Both are commercial enterprises. All these agencies also supply news to newspapers in many foreign lands.

Other Sources of News Material

An enormous amount of "copy" is sent out by newspaper syndicates. These supply a wide variety of material which small newspapers could not afford to prepare individually, such as cartoons, comic strips, fiction, household and fashion articles, and other "features." In recent years the syndicated "column" of news comment has sprung up to meet the increased interest in world affairs. Each columnist interprets the news according to his own views, and some have considerable influence on public opinion.

Another source of news is publicity material. This is information sent free by most large corporations and organizations. Even universities and government agencies issue "press releases" about their activities. Surveys have shown that as many as half the articles in some issues of newspapers have been built on publicity material. This often presents valuable information, but much of it is biased and written to promote special interests.

No other news field, perhaps, has developed so rapidly in recent years as that of pictures. Photograph syndicates have multiplied, and even small newspapers have established photographic departments. Many papers equip their reporters with cameras. Phototransmission by radio and wire enables American newspapers to print a picture of an event on the same day that it took place in Europe (see *Television and Telephotography*). The photoengraving department has therefore gained in importance, and rotogravure and color presses are now indispensable to large newspapers (see *Engraving and Etching*).

The Library or "Morgue"

A little-known but valuable source of material is the newspaper's library or "morgue." Originally this was a file of material for obituary articles, but it has grown into a great reference library. Each day articles are clipped from newspapers and magazines and filed in the library as background material for future articles. Some of the larger libraries house millions of clippings, several thousand photographs, hundreds of reference books, and huge stacks of bound volumes of the newspapers.

To save library space, many newspapers are now "micro-filmed." By this process, a whole page is photographed on a film about an inch and a half long—no larger than many postage stamps. The film is read in a viewing device called a "projector."

The MAN WHO DISCOVERED the LAWS that Rule the Universe

NEWTON, SIR ISAAC (1642-1727). "Nature and Nature's laws lay hid in night" for ages, but light slowly broke in the 17th century. Last of a great line of forerunners of the dawn, Galileo died in January 1642. That same year saw the birth of one greater than he, destined to shed the full light of day on the work of his predecessors — Isaac Newton, who was born on Dec. 25 (old style), 1642, at Woolsthorpe, England.

To compare the 17th century with the 20th is like comparing a stage-coach and an airplane or a wax candle and an electric light. In ideas the two centuries are even farther apart than in inventions, and the difference is largely due to the sudden flood of light poured on the order of the world by Newton. To realize what his discoveries mean to us, therefore, we must try to look a little way into the minds of men of two or three centuries ago.

In the first place, the iron clutch of *authority* on beliefs was only gradually being hammered loose by observation and experiment. "Authority"—do you know what that means? It means that when you asked a question about anything in the universe, you were answered, not by "Watch and find out," or "Try it and see," but "Here is what Aristotle, or St. Augustine (or some other writer dead a thousand years) says about it." Only a few bold souls realized that the one great "authority" on Nature is Nature herself, and had dared to put their questions to that greatest of teachers in the form of experiments

The Dim Conception of Natural Law

Again, the bare idea of *invariable natural law* was as yet vague and unformed. Of course, men had always recognized a certain order underneath Nature's apparent confusion. The sun always rises in the east and sets in the west; summer and winter, day and night, always follow one another; heavy objects dropped in mid-air always fall to the ground. But to most people, amid all the as yet incalculable waywardness of wind and weather and life and death, this seemed merely like the queer streak of reasonableness one sometimes finds in otherwise capricious persons—a riddle without an answer. Great minds from Heraclitus to Kepler, indeed, had dreamed of harmonizing the facts of Nature by some underlying universal law; but their attempts were mainly wild guesses, for lack of the exact knowledge furnished by observation and experiment.

Like the Kingdom of Heaven, the wonderland of science was at hand and all about them in the com-

monest everyday things; but its truths could not be understood except in the light of natural law. What passed for natural science in most people's minds before Newton's time was a mere hash of childish curiosities and far-fetched fables. The English Royal Society had what was called a "mermaid's bone" and

a "unicorn's horn," not to speak of a stag beetle whose horns worn in a ring were said to be good for rheumatism! What we call the "natural sciences" had no place in a "liberal education" at that time, for the very good reason that as yet they scarcely existed. The nature of light, of heat,

of sound, and of electricity were unknown; chemistry was still befogged with alchemy, and astronomy with astrology. The farthest outposts of scientific knowledge in the inorganic world were the discoveries of Galileo and Kepler in astronomy, mechanics, and optics (*see Astronomy; Galileo; Kepler*).

Such was the intellectual world into which Newton was born. He was the son of a gentleman farmer, who, dying before his only son's birth, left his widow in very moderate circumstances.

More Interested in Living Science than Dead Language

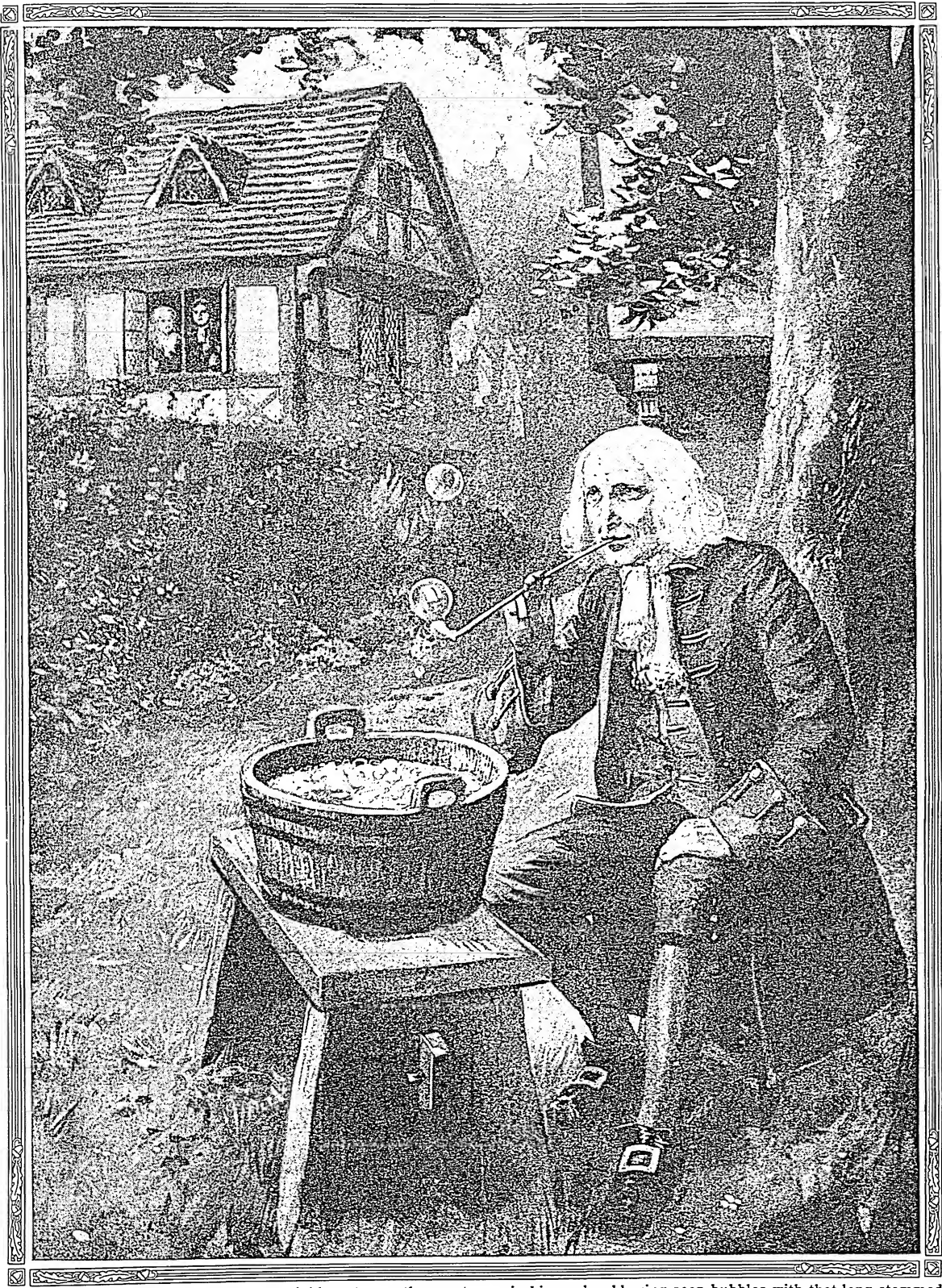
At school young Isaac, according to his own later accounts, was but an idler, until he was aroused by the desire to outstrip a young bully who stood above him in his classes. The classical Greek and Latin education of the times must, indeed, have been deadly dull to a mind like Newton's, all alive with curiosity about the universe of nature. Not being able to find out what he wanted to know in school, the boy "tinkered around" with tools, making now a windmill, now a water clock, and now a carriage to be propelled by the occupant—not to speak of sundials, and even doll furniture for little girl friends.

One science, to be sure—mathematics—did form a part of "every gentleman's education," and in this Newton was a discoverer almost as soon as he was a graduate. He developed the new method of calculus (or, as he called it, "fluxions") in the year of his graduation from Trinity College, Cambridge University (1665). The method is of great importance, not only in itself, but as a tool later used in proving the theory of gravitation, the germ of which seems to have lodged in Newton's mind about the same time. The "apple story" is told elsewhere (*see Gravitation*). The calculations of the moon's orbit, which Newton made then to test the gravitation theory, agreed "pretty nearly" with the known facts, but "to a mind like Newton's 'pretty nearly' is as bad as 'not at all,'"

THE HUMILITY OF TRUE GREATNESS

Though Newton's contributions to science were among the greatest ever made by any one man, he had the modesty of true genius. "If I have seen farther, it is by standing on the shoulders of giants," he wrote in reply to one who complimented him on his researches. And shortly before his death he wrote, "I seem to have been only a boy playing on the seashore and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great Ocean of Truth lay all undiscovered before me."

READING THE SECRET OF LIGHT IN A BUBBLE



It used to amuse Sir Isaac Newton's neighbors to see the great man in his garden blowing soap bubbles with that long-stemmed pipe. But it amused Sir Isaac himself a good deal more, for he was using these bubbles to find out why a sunbeam, striking these pretty globes, breaks up into all the colors of the rainbow. Newton's theory of light was the first of his great contributions to science.

and so gravitation was laid aside for the time being.

Now began the series of careful, logically conducted experiments on light and color, which were to lead to the first of his great discoveries in natural science. By 1669, the year in which he was appointed professor of mathematics in Cambridge University, Newton had demonstrated the compound character of light and the fact that color resides not in the object but in the light itself. These discoveries were not made public, however, until 1672, when Newton reported them to the Royal Society. His studies of light also led him to the invention of the reflecting telescope.

Newton's Theory of Light

Newton explained light by the "corpuscular" theory—that is, that it was caused by a stream of minute particles or "corpuscles," given off at a high velocity by a luminous body. Scientists later adopted the "undulatory wave" theory (see Light). But since then the discovery of radium and the manifestations of radioactivity have proved the existence of minute particles moving with the high speeds needed for Newton's corpuscular theory, and now we are not so sure that Newton was wholly wrong on this point. (See Atoms and Electrons; Einstein, Albert; Radium.)

Just when Newton began to study again the problem of gravitation is not known, but in 1684 the astronomer Edmund Halley stumbled upon the fact that the quiet Cambridge scholar had worked out in solitude the principles of the theory. At Halley's urgent desire, Newton set them forth in the great work generally called the 'Principia' (*Philosophiæ Naturalis Principia Mathematica* or 'Mathematical Principles of Natural Philosophy'). It is said that there were not 12 men in Europe capable of understanding this book at its publication in 1687. It has been called the greatest single contribution to science ever made by any one man. It established the ideas of "mass" and "force," the principles of the mechanics of the heavenly bodies, and the science of theoretical mechanics as it exists today.

A Great, Gentle, Modest Soul

Far from seeking recognition for his work, Newton shrank from publicity to a degree that is almost unknown today. Controversy was distasteful to him, and the dispute with the German scientist G. W. Leibnitz over the calculus (which the two men seem to have invented independently) was the exception to a rule deliberately adopted and closely adhered to. But when James II interfered illegally with the universities, Newton took an active part in defending the University of Cambridge. Later he was elected to a seat in the Convention Parliament which seated William and Mary on the throne in place of James II. His friend Charles Montague, chancellor of the exchequer, then appointed him to a position in the mint, in 1696, and in 1699 he was made its head.

Now we may see our philosopher enjoying a modest yet ample fortune—"three lackeys to his coach and as many servants indoors." A charming and devoted niece kept his establishment running smoothly, and

his income permitted him to dispense his bounty generously to needy men of science and members of his own family. In 1703 he was elected president of the Royal Society, "the highest honor in science to which an Englishman could aspire." Knighthood at the hand of good Queen Anne followed in 1705, with the prefix "Sir" to his name. So peace and prosperity were Newton's lot until his death in 1727. His ashes lie today among the great in Westminster Abbey.

A well-known story—which, however, is not certainly true—tells how one day Newton's little dog Diamond, while alone in his master's study, overturned a candle which set fire to the great scientist's papers, and destroyed the work of years. "Ah! Diamond, Diamond! Thou little knowest the mischief thou hast wrought!" is said to have been Newton's only comment. Whether true or not, the story illustrates the serenity of Newton's temper.

NEW YEAR'S DAY. When we celebrate the first day of the new year, we are following a custom that dates back to the very dawn of civilization; for nearly all peoples have observed a new year's celebration, though the time has varied widely—sometimes as early as the autumnal equinox (about September 21), sometimes as late as Midsummer's Day (June 22).

If we could travel around the world on a magic carpet and peep at the new year celebrations in the various countries, what a wonderful variety of customs we should find! If you were in China you might think that the Chinese were celebrating all their holidays for the year at once, for they close their shops for several days while they make merry with feasts and fireworks and the general exchange of gifts and good wishes. In preparation every debt must have been paid, every house swept and cleaned, and each person furnished with holiday clothes and a supply of preserved fruits, candies, and ornamental packages of tea to give to his acquaintances.

The Japanese New Year festival is perhaps even gayer. No matter how poor he may be, everyone provides himself with shining new clothes and takes three days off from work to visit his friends or entertain them at his home. Every gatepost is adorned with dark green pines and feathery light green bamboos, while over the doorways hang vivid red lobsters and crabs, and scarlet tangerine-like fruits, symbolical of long life and happiness. The streets are thronged with happy children playing battledore and shuttlecock the whole day long, and everyone beams with joy, bowing and wishing the compliments of the season even to perfect strangers.

Throughout the rest of the Orient, too, the opening of their New Year is celebrated with elaborate festivals that correspond to the Christmas celebrations of Western countries. In some European nations also, especially France and Scotland, New Year's Day is a more important holiday than Christmas. If you were a French peasant child you might put your *sabot* (wooden shoe) on the hearth for a gift at Christmas, but grown-ups in France exchange gifts at the

New Year festival, at which time there are family parties, with much merrymaking and a general exchange of visits.

Scotland celebrates New Year's Eve with a heartiness nowhere surpassed. The old-time tradition that to be "first-foot" in a house brings luck for the whole year sends throngs of midnight revelers into the streets of Scotch cities on New Year's Eve, each with his box of cakes and his spiced ale, for in order to insure his host a bounteous year he must not enter empty handed.

Some cities have their special local customs. Formerly in Leningrad (Russia) the New Year was ushered in by a cannonade of one hundred shots fired at midnight. In some Scandinavian cities also, the New Year is welcomed with a noise of firearms, while the Yuletide celebration continues until Twelfth Night (12 days after Christmas), as in Italy.

In America the observance of New Year's Day is as varied as the character of the people that make up the New World. Each city and rural district has its New Year's Eve "watch night" service in the churches, its dancing and theater parties, its gay street revelers; and New Year's Day is a time for general entertaining and visiting. The former custom, however, of keeping open house and making New Year's calls has practically disappeared.

March 25 was the usual date for beginning the new year in most Christian countries in the Middle Ages, and England retained this date until 1751. In those countries which still use the Julian calendar New Year now comes on January 13 of our reckoning (see Calendar). The Jewish New Year, which opens with Tishri, our September, is called the "feast of the trumpets" and lasts for 48 hours. The Chinese New Year now coincides with that of the Western World.

WEALTH and POWER of the "EMPIRE STATE"



In the Catskills—View from Otis Summit across the Hudson Valley

NEW YORK. The Empire State! Greater in size than any one of half a dozen European countries, New York is nevertheless small in area as compared with most of the states of the United States, for more than half the number surpass it in extent. It is, however, the Empire State because it is greatest in population, in commerce, and in manufactures; because of its influence on the history and development of the United States; because it controls the great eastern gate-

Extent.—East to west, 326 miles (412 miles including Long Island); north to south, 312 miles. Land area, 47,929 square miles; water area, 1,647 square miles. Population (1940 census), 13,479,142.

Natural Features.—Chief mountain groups, Adirondacks (highest point, Mount Marcy, 5,344 feet) and the Catskills. Borders on Lakes Ontario, Erie, and Champlain; chief interior lakes, George, Oneida, Cayuga, Seneca, Canandaigua, and Chautauqua. Principal rivers: Hudson and Mohawk; St. Lawrence and Niagara on the boundaries. Niagara Falls, about a mile wide and 167 feet high. Mean annual temperature, 46°; mean annual precipitation, 39".

Products.—Clothing, knit goods, silk, other textiles, millinery; printing and publishing; meat packing, flour and mill products, sugar refining, other food products; machinery, iron and steel, chemicals, lumber products, shoes, other leather goods, paper; hay, fruits, vegetables; cattle, dairy products, poultry; clay, stone, slate, gypsum, cement, sand and gravel, aluminum.

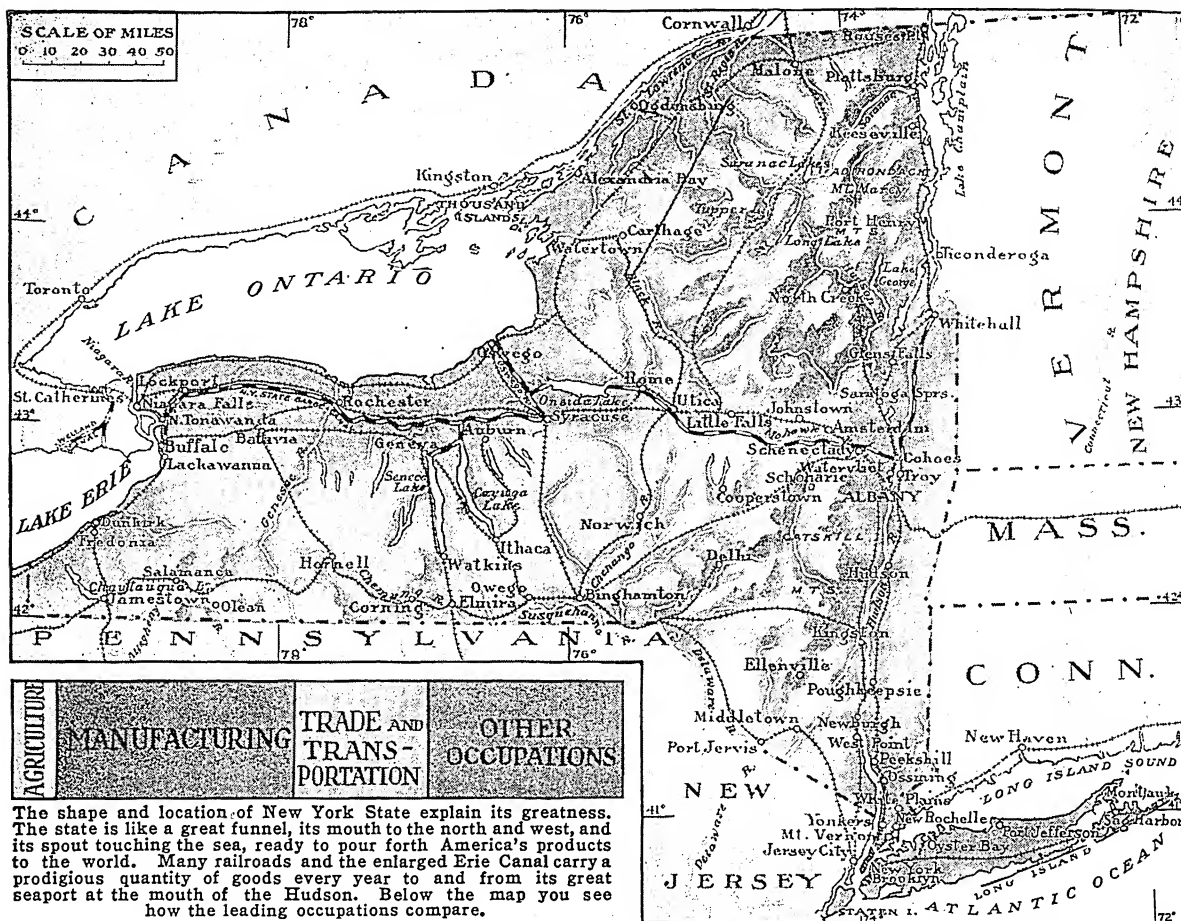
Cities.—New York City (7,454,995), Buffalo (575,901), Rochester (324,975), Syracuse (205,967), Yonkers, Albany (capital), Utica (over 100,000); 28 other cities above 20,000.

way to the country and the highway to the West; and because New York City is now the greatest financial center of the whole world.

Take away New York City, however, and New York State loses not only its financial preëminence, but it is left with a smaller population and

a smaller volume of manufactures than Pennsylvania with Philadelphia subtracted. Is the Empire State, then, nothing in itself—merely a background and appendage to the imperial city of New York?

THE VAST FUNNEL FROM LAKES TO OCEAN.



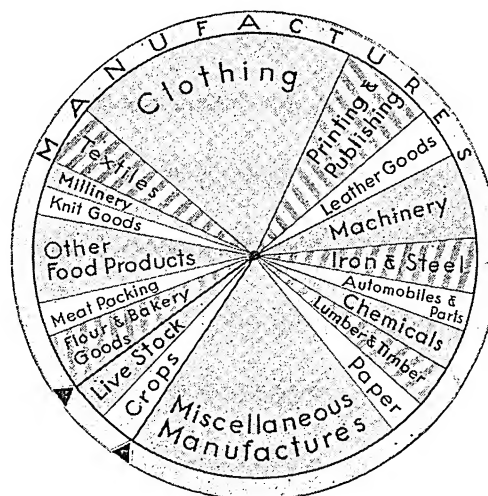
No; the greatness of the state and the city can scarcely be weighed separately, so much does each contribute to the other's welfare and prosperity.

The tiny scrap of coast where New York State thrusts its shoulder down between New England and New Jersey is commercially worth all the rest of the United States coast line. For that bit of seacoast has one of the finest harbors in the world, nearer to Europe than any other important harbor of the United States except Boston. Yet without the inland highway to the West through the Mohawk-Hudson Valley, this magnificent port would never have made New York City the world metropolis that it is, and without this commercial advantage New York's abundance of water-power and nearness to the Pennsylvania coal beds would probably not have

made the state supreme in manufactures. The Empire State is great for many reasons, but above all because of the geographic factors which make it the warder of our greatest gate, and permit it to

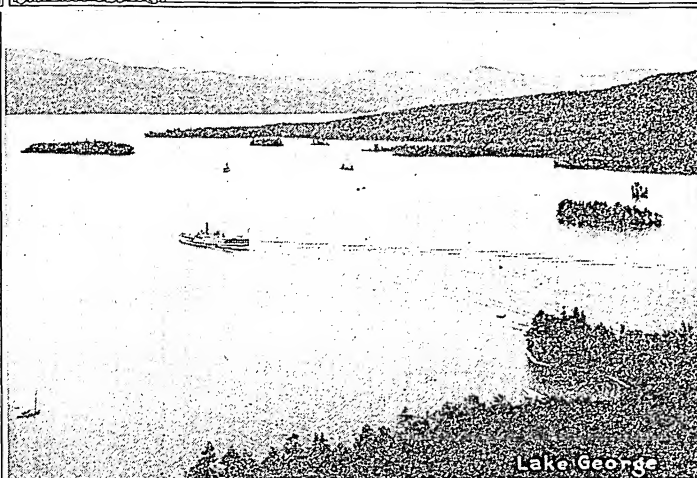
stretch out one hand to Europe and the other to North America's teeming interior.

Also New York has an imperial variety of geographic forms within its borders—a sample, or at any rate a relic, of almost every geographic feature of the United States that can be named. There are, to be sure, no active volcanoes, but some excellent samples of volcanic rock are seen in the black trap of the towering Palisades of the Hudson. There are no glaciers, but you can find many beautiful examples of the work of the glacier that covered nearly the whole of the state during the Ice Age. There



A glance at this products chart shows you what an immense variety of manufactures comes from the Empire State.

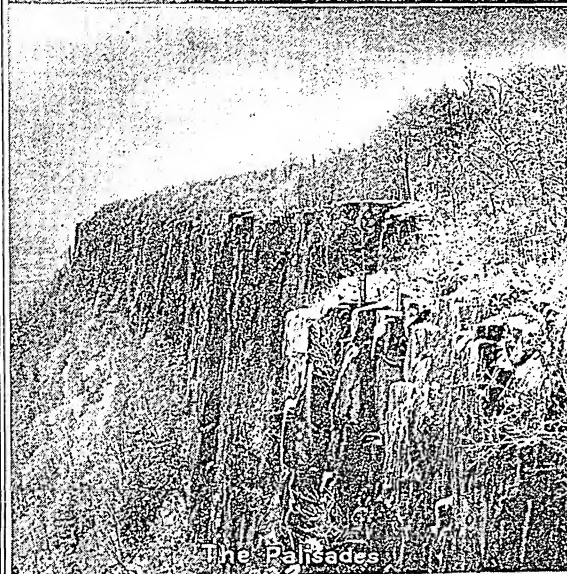
NEW YORK IN SOME OF ITS SCENIC ASPECTS



Lake George



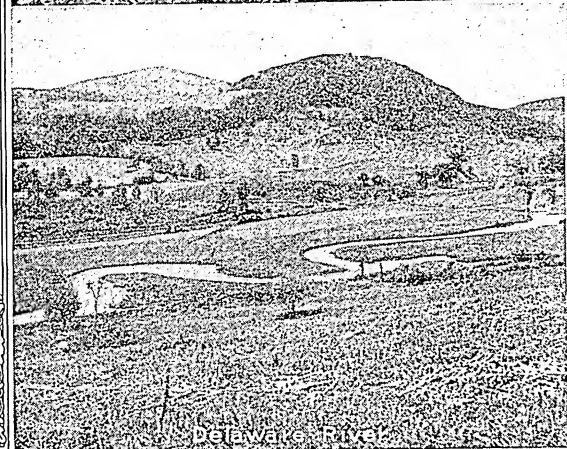
Wilmington Notch
Adirondack Park



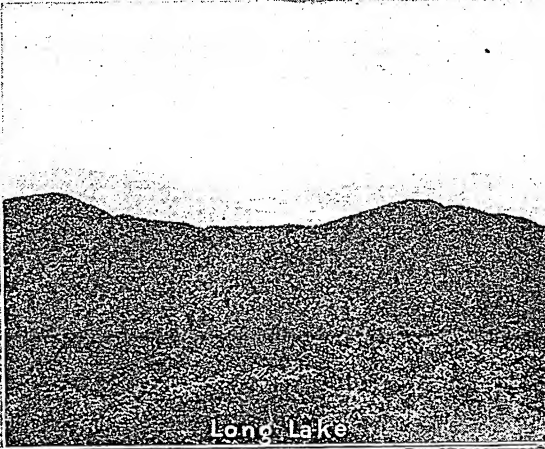
The Palisades



Hudson River



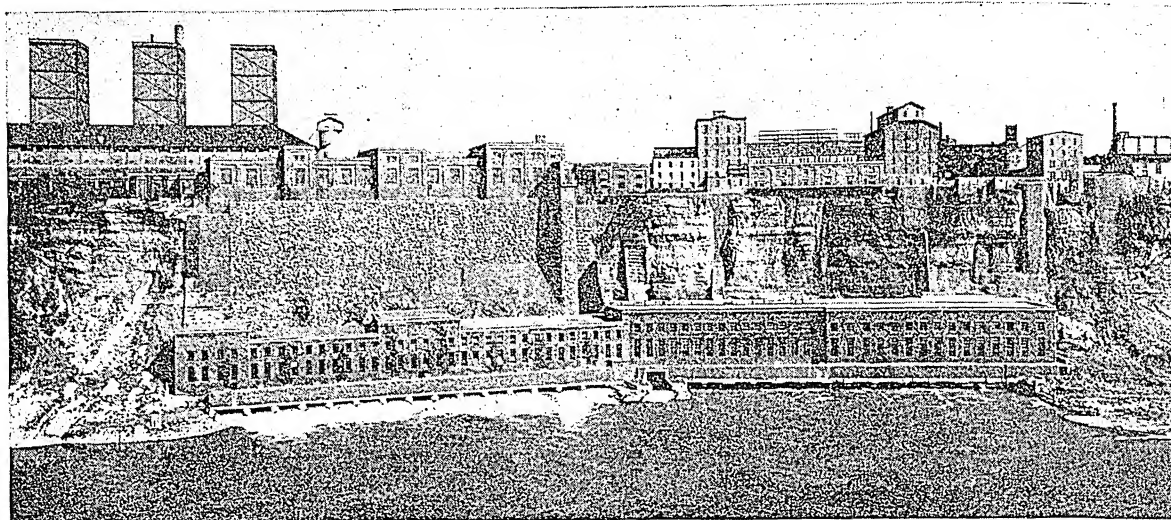
Delaware River



Long Lake

While the great commonwealth of the Hudson and Mohawk is notable for its wealth and industry, it has its charming aspects as well—jewel-like lakes, frowning cliffs and mountains, majestic rivers and quiet streams wandering through rich valley farms. Lake George in the eastern part of the state is a well-known and attractive vacation region. Wilmington Notch is one of the many scenic spots in the Adirondack Mountains, while the Palisades loom above the Hudson within sight of New York City. In striking contrast are the upper valleys of the Hudson and the Delaware with their scenes of restful beauty. Long Lake, 14 miles long and only about a mile wide, is in the Adirondacks.

NIAGARA FALLS IN ITS "WORKING CLOTHES"



The big Schoellkopf station of the Niagara Power Corporation at Niagara Falls works at a full load 24 hours a day, developing 452,000 horse-power. This is only a small part of the 6,000,000 horse-power which the famous falls could produce, but to utilize all this power would destroy the beauty of this marvel of nature. Niagara today furnishes electricity in an area of 25,000 square miles, serving more than 2,000,000 people. A plan is suggested to use more water and also check the wearing away of the falls.

are no Saharas, but some very pretty miniature deserts exist in the sand dunes of Lake Ontario and Long Island. As for rivers, the great St. Lawrence forms part of its northern boundary; the majestic Hudson is all New York's own; the Mohawk and its tributaries form one of the busiest industrial river systems in the world; and not only matchless Niagara, but a score or more of head-long streams hurry down wonderful falls, cascades, and rapids. Lakes Champlain, Ontario, and Erie form part of the state's boundaries, and within its area are historic Lake George, Lake

Chautauqua—the highest navigable body of water (1,512 feet) east of the Rocky Mountains—Lake Oneida, and the beautiful "Finger Lakes," Cayuga, Seneca, and the rest, together with many another charming body of water. As for islands, the city of New York is built on what may almost be called an archipelago; Long Island, which measures 110 miles

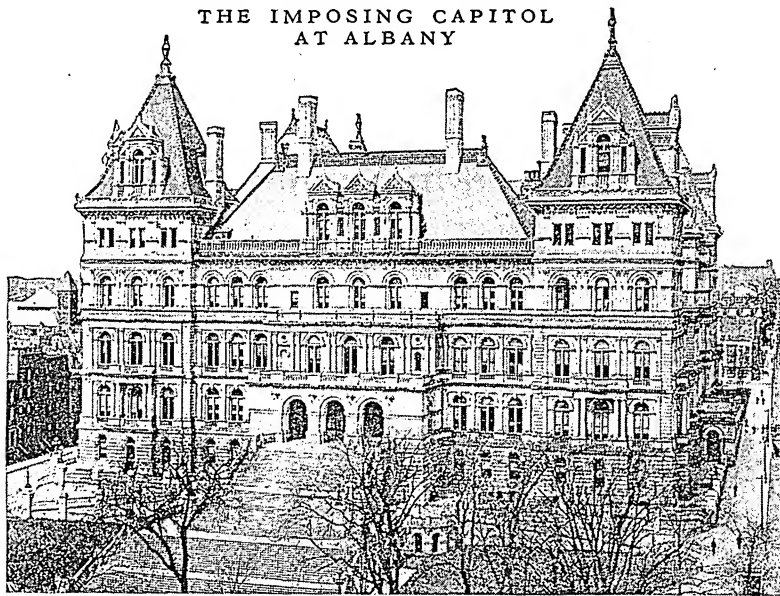
by 20, is the greatest island possession of the United States outside of Porto Rico, Hawaii, and the Philippines; and the picturesque Thousand Islands in the St. Lawrence, some of which belong to New York, are

favorite summer resorts. If you speak of mountains, the Adirondacks and Catskills are famous and much frequented as health and pleasure resorts, the former especially for the treatment of tuberculosis. Valleys, plains, chasms, gorges, natural bridges—all are within the state's boundaries.

The foundations of New York's commerce were really laid in the long-ago geological

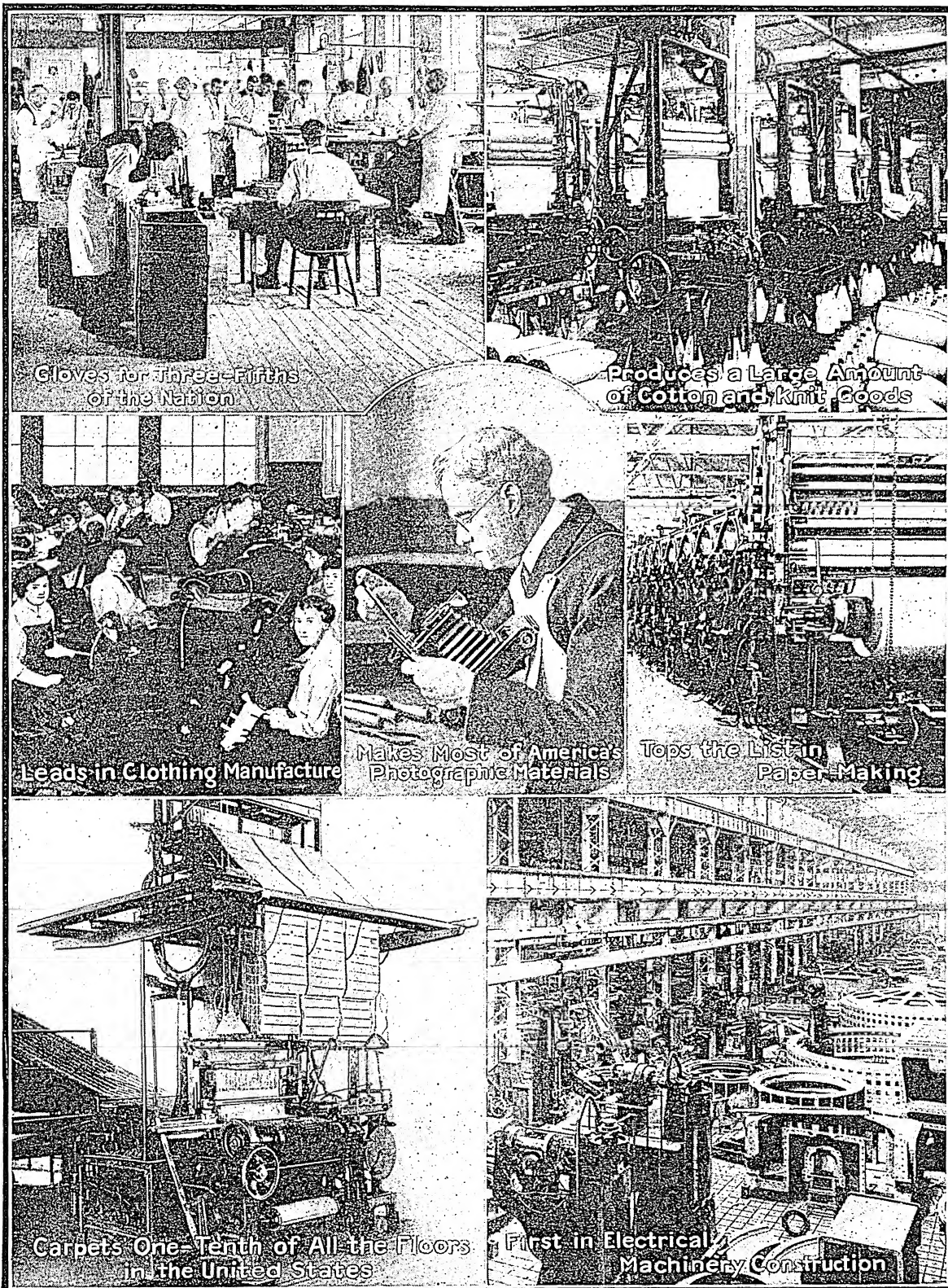
days when the Atlantic coast was tipped down into the water; this drowned the Hudson valley up to Troy, and made islands of the lands near the river's mouth, and a fine sheltered port right within its jaws—not to speak of an inshore waterway to New England through Long Island Sound. Henry Hudson, in 1609, was thus able to steer the *Half Moon*, flying

THE IMPOSING CAPITOL AT ALBANY



The original designs for the imposing structure of white granite that houses the government of New York State were made by Thomas Fuller, the same architect who designed the Parliament Buildings for Canada, and the buildings show many resemblances. This is one of the few state capitols which departs from the pattern set by the National Capitol in Washington.

A FEW OF NEW YORK'S INDUSTRIES



Gloves for Three-Fifths
of the Nation

Produces a Large Amount
of Cotton and Knit Goods

Leads in Clothing Manufacture

Makes Most of America's
Photographic Materials

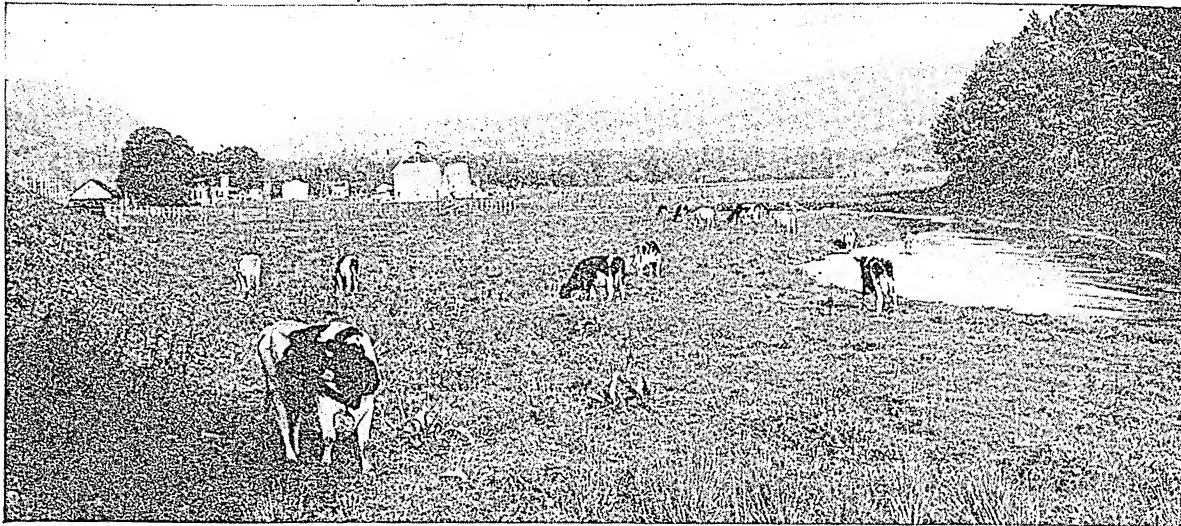
Tops the List in
Paper-Making

Carpets One-Tenth of All the Floors
in the United States

First in Electrical
Machinery Construction

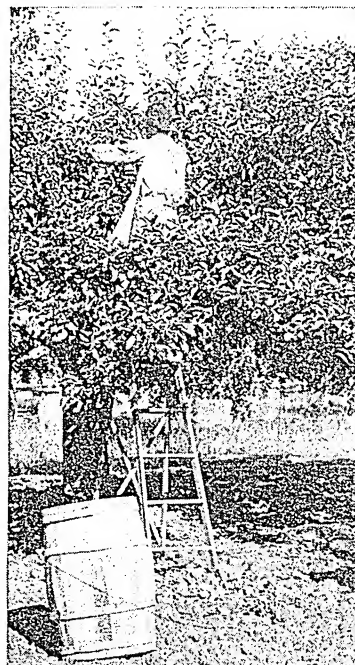
Here we see some of the products which make New York State the foremost manufacturing state of the Union. These industrial honors are shared between New York City and the large upstate communities. Rochester is world famous for photographic materials, while Schenectady is foremost in electrical supplies.

FIELDS, ORCHARDS, AND DAIRY FARMS



the Dutch flag, 150 miles up the river that bears his name, past the present site of Albany. The next important factor is the Mohawk valley, which enters the Hudson valley at right angles just where the Hudson River ceases to be navigable. The presence of several waterfalls makes the Mohawk unnavigable; but the valley not only opens a gap through the Appalachians, but offers the best highway from the Atlantic coast to what we know as the Central States.

New York was the first of the original thirteen states to cede to the Federal government (in 1781) its claim on the Old Northwest; and its reward was found in a rise to power with the growth of the states formed from that territory. First, however, the chain of water transportation had to be completed, joining east to west. In 1807 Fulton's steamboat, the *Clermont*, made its first trip between New York and Albany. Three years later the first steps were taken toward the realization of the dream of a water link between Lake Erie and the Hudson River along the Mohawk valley. The Erie Canal, finished in 1825, put new life into



These three pictures give us a fine idea of what country life in New York State is like. The upper picture shows one of the dairy and cattle farms. Of the lower two, the one on the left shows a field of buckwheat at harvest time, and the one on the right, an apple orchard.

western New York State, made Buffalo "the great doorway of the Inland Seas," and initiated the era of canal-building as well as the further development of the Central States.

The Erie was only the greatest of New York canals; no other state during the "internal improvement" period had such a system of inland waterways, because none had such good natural canal routes. Railroad building began early in New York (in 1831), but the canals held their own and kept freight rates down

for 25 or 30 years. The railroad competition and political mismanagement caused a period of neglect and ruin for the whole New York canal system. During the World War, however, when they were called upon to relieve the overburdened railroads, canals once more proved their worth. The Erie Canal was especially important in the movement of wheat from the Middle West to the seacoast for export. In 1918 New York's canals were consolidated under a single system, 525 miles long, known as the New York State Barge Canal. The old Erie Canal is the most important link in the chain. It is about 340 miles long, con-

necting the Hudson River near Troy with the Niagara River at Tonawanda. The Champlain Canal branches from the Erie at Waterford, near Troy, extending 60 miles north to Lake Champlain. The Oswego Canal, from Three River Point, on the Erie, to Lake Ontario, is 24 miles long. South of the Erie, a 92-mile branch goes to Lakes Seneca and Cayuga. The channel of the system is 12 feet deep and from 75 to 200 feet wide. There are 57 locks. Millions of tons of cargo move over the canal every year. Petroleum, west bound, is the most valuable item and the largest in tonnage. Sulphur, fertilizers, sugar, and manufactured goods also go west. Iron ore, wheat, sand, stone and gravel, flour, paper, chemicals, and drugs move east.

Water Power

In addition to providing cheap transportation, the natural waterways also furnish cheap power for the state's manufacturing industries. New York has more water power, both developed and potential, than any other state in the country except the Pacific states. Niagara Falls is the greatest source. Powerhouses at the city of Niagara Falls transmit electric energy to Buffalo and other cities. The upper Hudson, the Black River, the Oswego, and the Mohawk and its tributaries all furnish electric power.

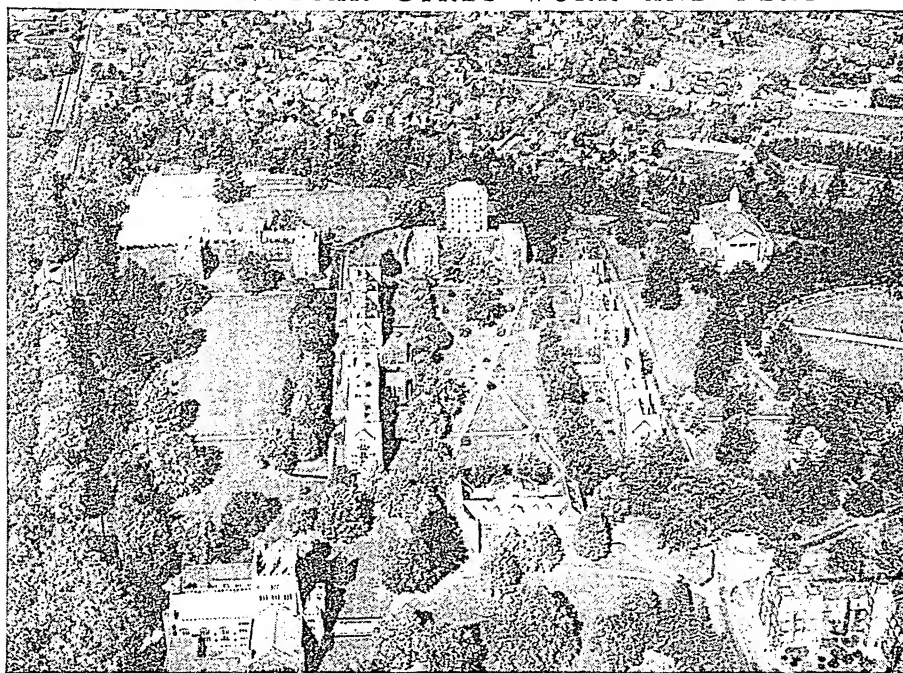
Development of Manufacturing

Cheap power and transportation gave the original impetus to the development of manufacturing and the growth of cities. Most of the large cities are either on the route of the Barge Canal or on the Hudson River. Three-fourths of the people live within two miles of a river, canal, or lake.

New York has long led the nation in the value of its manufactured goods. New York City produces about 60 per cent of the state's total. The leading industry in value is the manufacture of men's, women's, and children's clothing. In this industry New York State far outranks any other state, and New York City, with its abundant labor supply, clothes a large part of the nation. In such related products as knit goods, embroidery and trimmings, buttons, gloves and mittens, and furs, the state is also first. Gloversville and Johnstown are the centers of the glove industry. New

York City is first in printing and publishing. Buffalo has replaced Minneapolis as the country's most important flour-milling center, although the state as a whole is second to Minnesota. Rochester makes more photographic materials and optical instruments than any other city in the United States. Electrochemical industries center at Niagara Falls. Paper,

WHERE VASSAR GIRLS WORK AND PLAY



Vassar College near Poughkeepsie is built around the central grounds shown in this photograph by Fairchild Aerial Surveys. The Quadrangle is bordered by residence houses, including tall-towered Jewett at the far end. Across the lower end is Rockefeller Hall. The buildings outside the Quadrangle are Thompson Memorial Library (lower left), Josselyn House (upper left), Students Building (upper right), and Main Building (lower right).

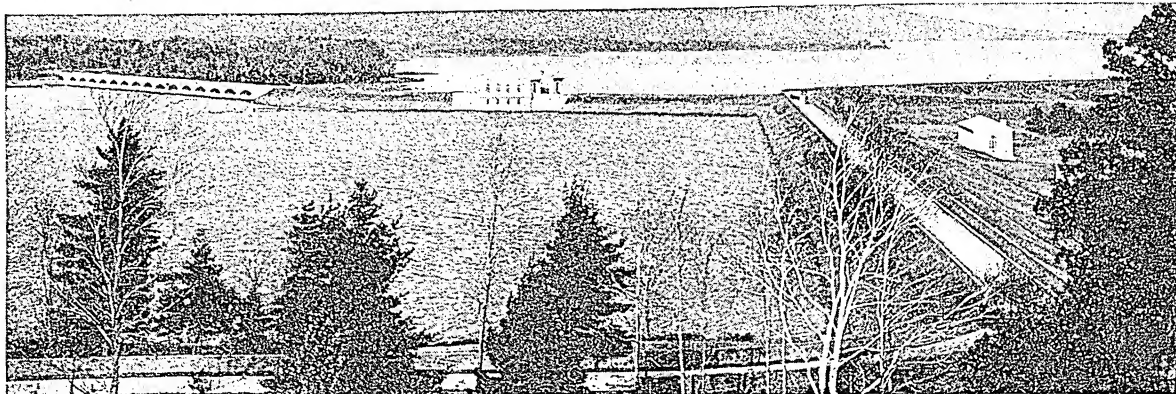
refined sugar, furniture, jewelry, toys and games, carpets and rugs, dentists' equipment, cosmetics and toilet preparations, and perfumes are other items on the long list of products in which New York leads.

How Agriculture Specializes

Agriculture has specialized to serve the needs of the state's large urban population. New York City's seven million people and the two million in other great cities provide an enormous market for such perishable foods as milk, fruits, and vegetables, which must be transported quickly, and for bulky foods, such as potatoes, which are expensive to move long distances. Dairying is the chief source of farm income. About seven billion pounds of milk are produced each year. Most of it is marketed as fluid milk and cream, but much is used in making cheese and condensed, evaporated, dried, and powdered milk. In cheese the state usually ranks second to Wisconsin.

In growing hay New York leads the country. A larger acreage is devoted to hay than to all other crops combined. Orchards and vineyards flourish along the southern shores of Lakes Erie and Ontario and in the Finger Lake region, where lake winds modify ex-

LAKES THAT KEEP NEW YORK FROM BEING THIRSTY



This great body of water, the Ashokan Reservoir, is impounded in the Catskill Mountains for the use of New York City, and furnishes 500,000,000 gallons a day, delivered to the city limits through an aqueduct 92 miles long. Of this, 31 miles was tunneled through rock, and includes a remarkable stretch 1,100 feet below the surface of the Hudson River. The aqueduct is also carried beneath the Croton Reservoir, so that water from it may be delivered through the Croton system when desired. The view shows the dam dividing the Ashokan Reservoir into two parts. The division is made so that if water in one part becomes impure, the other can be used while the first is cleaned up.

tremes of climate. The state ranks second in the production of apples, cherries, and grapes. Near the cities are great truck farms, and elsewhere vegetables are grown extensively for canning. Potatoes are a large crop. Cereal crops are grown chiefly for stock feed and for local use.

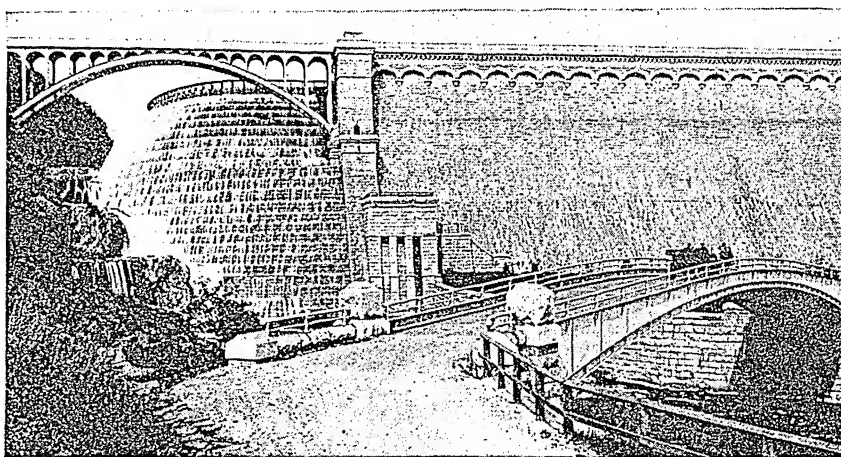
Important Cities

The state's largest cities, after New York City, are Buffalo, Rochester, and Syracuse. (These and the capital, Albany, are described under their own names.) Other populous cities are Yonkers and Utica. The latter is on the Mohawk River and the New York State Barge Canal. With abundant water power from the Adirondacks, and easy access to Pennsylvania coal, it manufactures about a third of the knitted underwear made in the United States. Metal products, clothing, chemicals, and textiles are other important manufactures. The site of Utica was in the manor of 22,000 acres granted in 1734 to William Cosby and his associates by King George II.

Yonkers is on the east bank of the Hudson River, adjoining the northwest limits of New York City. Its principal manufactures are elevators, sugar, wire and cable, hats, and chemicals. In 1646, Adrian van der Donck received a large grant of land which included Yonkers. The settlement was called De Jonkheer's Land—the young lord's estate—which became corrupted to Yonkers. Van der Donck was the first historian and the first lawyer of New Netherland. The destiny of New Netherland—or New York, as

it was called when it passed from the Dutch to the English—was foreshadowed by its early history. Even in colonial days, the population of Massachusetts was

WHEN THE "DRINKING CUP" RUNS OVER



This view shows the spillway at the Croton dam. This dam, with its auxiliaries, can impound approximately 100 billion gallons of water, and two aqueducts deliver 372,000,000 gallons a day. Even this great supply, however, is not enough for the metropolis, and the great Catskill project shown above was needed to help out. The dam is 1,200 feet long, 297 feet high from its foundation, and 210 feet above the old river level.

homogeneous, whereas that of New Amsterdam was cosmopolitan. New Amsterdam spoke 16 languages and dialects when it had only a thousand inhabitants. Today the chief gate of immigration, New York has double the foreign population of any other state. Dutch Van Rensselaers, Roosevelts, Schuylers, and Stuyvesants, German Astors, English Clintons, Scottish Livingstons, French De Lanceys—almost every nation under the sun has contributed to make New York the great state that it is.

Beginnings of New York History

Probably the first European to enter New York harbor was Giovanni da Verrazano, an Italian navigator in the French service, who is believed to have sailed his ship *La Dauphine* past Sandy Hook

in 1524. The Frenchman Samuel de Champlain probably was the first white man to set foot within the limits of the state. He started south from Quebec early in 1609 and discovered the lake that is named after him. In September 1609, Henry Hudson, sent out by the Dutch East India Company to find a water route across the continent to the Pacific, sailed far up the Hudson River (*see* Hudson, Henry). His reports of the beauty and wealth of the country lured a few Dutch fur traders into the upper reaches of the river, and by 1614 they had constructed Fort Nassau on an island near the present city of Albany, as an outpost for trade with the Indian trappers.

First Colonists Arrive

The first colonists to New Netherland, sent out by the Dutch, were 30 families of Walloons, descendants of Protestant refugees from south-east Belgium. They landed on Manhattan Island in 1623. Some of them established the trading post New Amsterdam on the southern tip of the island, a few settled on Long Island, and the majority went on to establish permanent homes at Fort Orange (later, Albany), which became an important post for fur trading. The Dutch West India Company after its organization in 1621 sent over more colonists, who developed the fur trade; and by 1626 the success of the thriving colony at New Amsterdam was assured.

In that year, the company appointed its first director-general, Peter Minuit, who at once obtained from the Manhattan tribe of the Wappinger Confederacy, belonging to the Algonquian family, permission to use the island and to build a fort on the spot later called The Battery. For these privileges he paid the Indians in goods worth about \$24. Since the Indians knew nothing of land tenure, and it was foreign to their ideals ever to part with land, they did not really sell the site to the Dutch, but they merely gave the whites permission to settle there.

The Patroon System

Beginning in 1629, the Dutch West India Company conferred the title "patroon," or patron, to anyone who would send to New Netherland a colony of 50 men and women over 15 years of age. The patroon, who became a member of the company, gave the

money for transportation and supplies, and in return was allowed to select a tract of land along the Hudson River—eight miles on both sides or 16 miles on one side and as far inland as he cared to go. This plan, known as the "patroon system," was based on the feudal arrangement of a landed aristocracy. The patroons ruled their estates like lords, with full governmental and judicial powers. Manhattan Island was excepted in these grants. Kiliaen van Rensselaer of Amsterdam obtained a tract about Fort Orange, which has since become a greater part of the present counties of Albany, Rensselaer, and Columbia.

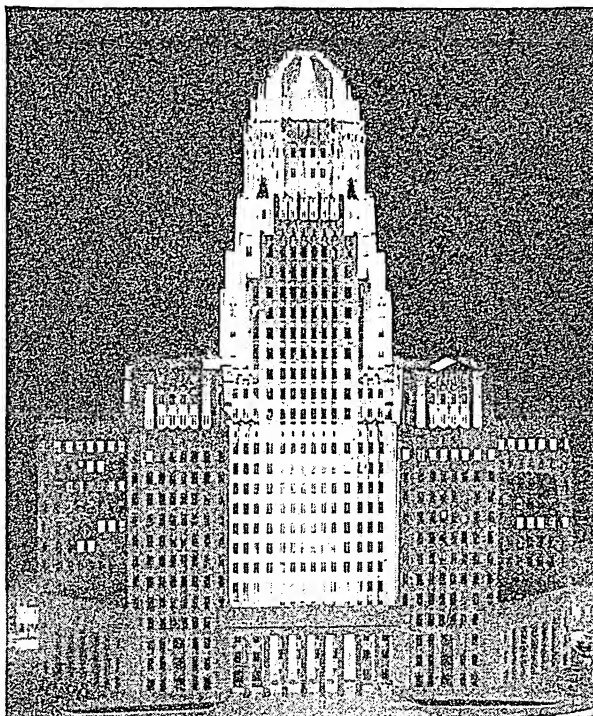
Michael Poauw secured from the Indians Staten Island and the land on which Jersey City and Bayonne now stand. Minuit was recalled, and two years later was succeeded by Wouter van Twiller, who made a fortune by dealings in land. Van Twiller was recalled in 1637 and was succeeded the next year by William Kieft, whose ten years of service were noted principally for strife with the Indians and with the English. In 1647 Kieft was replaced by Peter Stuyvesant, a picturesque character with a wooden leg, which bore witness to his services in the Netherlands West Indian wars. Stuyvesant conquered the Swedish colonies on the Delaware, resisted the growing pressure from claims of

the New England colonies and the jealous English government at home, and browbeat the Dutch settlers who clamored for greater self-government. He had a favorite expression: "We derive our authority from God and the Company and not from a few ignorant subjects." New Netherland prospered under him.

In 1664, during a war between the English and the Dutch, the English captured New Netherland, and Charles II gave the colony to his brother, the Duke of York, afterwards King James II. Both the city and the province were renamed New York in honor of the Duke. Col. Richard Nicolls, who commanded the fleet that took the city, was made governor, and was followed by Francis Lovelace in 1668. New York was recaptured in 1673 by a Dutch fleet, but was returned to the English in 1674.

Sir Edmund Andros was the first English governor after the war with Holland. Dissension with New

LIGHTS ON BUFFALO'S CITY HALL



Floodlights at night show up the fine architectural details of Buffalo's \$7,000,000 City Hall on Niagara Square, the civic center of the city.

Jersey caused his recall, and in 1682 Thomas Dongan was made governor. In 1683 the "Charter of Liberties and Privileges," which granted freedom of religion to all Christians and suffrage to all freeholders, was drawn up by 17 representatives of the colony. This, the first bill of rights in America, was signed by the Duke of York, but he repudiated it when he became King James II shortly afterwards. Sir Edmund Andros became governor of the Dominion of New England in 1688, and New York was joined to this territory under Lieutenant-Governor Nicholson.

When the revolution broke out in England, many members of the colony sided with William and Mary. In 1689 Jacob Leisler, a colonist of German birth, led an insurrection against King James, and began to repair the fort at New York City. A battery of six guns was placed beyond its walls, and the park now standing on that spot is known as The Battery. William and Mary sent over Henry Sloughter as governor in 1691. Leisler finally surrendered to Sloughter and, after what was said to have been an unfair trial, was hanged for treason.

The period from 1690 to the American Revolution was marked by great corruption, but despite political disturbances the colony grew. From 1720 to 1771, the population increased from 31,000 whites and 4,000 negroes to 150,000 whites and 18,000 negroes.

Battle for Freedom of the Press

In 1733 the *Weekly Journal* appeared in opposition to the first newspaper, the *Gazette*, a government organ which had been established in 1725. John Peter Zenger, the publisher of the *Weekly Journal*, was a German immigrant, and his paper, which was opposed to the governor, was supported by Chief Justice Lewis Morris and other men of prominence. Zenger was imprisoned in 1734, charged with printing seditious libels, but was acquitted by a jury. This decision established liberty of the press for the colonists.

Sir William Johnson, who came to the colony in 1738 to manage the estate of his uncle, Captain Warren, on the south side of the Mohawk River, near Schenectady, has an important place. He learned the Indian language and was adopted into the Mohawk tribe as a sachem. Johnson, appointed colonel of the Six Nations in 1744, became a member of the provincial council in 1750, and in 1754 was a delegate from New York to the congress of Albany, and to the great council with the Indians. In 1755 General Braddock made Johnson "sole superintendent of the affairs of the Six United Nations, the allies and dependents" and he was commissioned to be Crown Representative to the Indians the following year. In 1764 Sir William built Johnson Hall, where he lived in true baronial style until his death in 1774. Johnson, N. Y., was named after him.

Active in the American Revolution

New York was a leader among the colonies in protesting against various measures of the English Parliament which they believed were unfair and oppressive. It sent petitions to Parliament and to the

king in 1764, and its assembly appointed a committee to correspond with the other provinces on the subject of the "common cause." A Colonial Congress assembled in New York in October 1765, and the refusal of the assembly to vote supplies for the British troops caused the battle of Golden Hill, on John Street in New York City, between the Sons of Liberty and British soldiers on Jan. 18, 1770. (See also American Colonies; Revolution, American.)

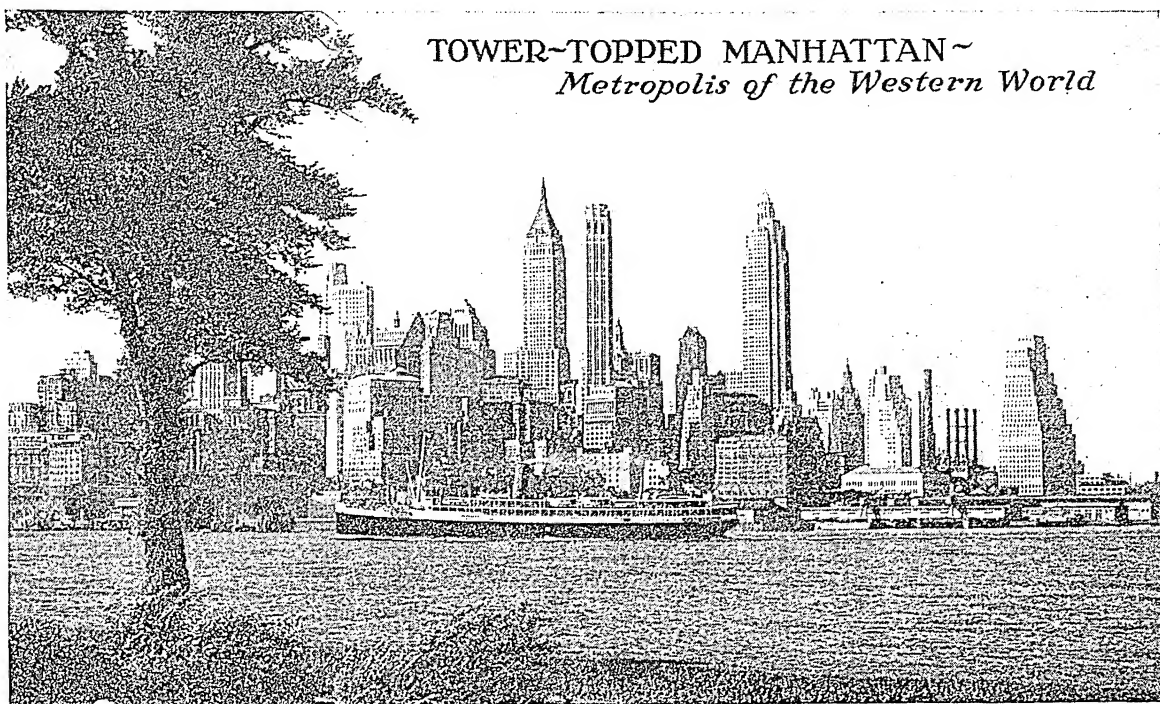
After the Revolution, New York's economic progress continued, and when the Civil War broke out it had a population of nearly 4,000,000 (see Civil War). The story of its growth since centers around its chief port and largest city (see New York City).

New York has long been considered a "pivotal state" in presidential elections because it has the largest vote in the Electoral College. Six presidents have been New York men. Four of them (Van Buren, Cleveland, Theodore Roosevelt, and Franklin D. Roosevelt) had served as governors. Another ex-governor, Samuel J. Tilden, missed election as president in 1876 by a few votes. As chairman of the Democratic state committee Tilden broke up the notorious "Tweed Ring" of New York City (see Tammany). He was governor from 1874 to 1876. On his death in 1886, he left part of his fortune for the establishment of a free public library in New York City. It was combined in 1895 with the Astor and Lenox libraries as the New York Public Library.

The state is governed under a constitution adopted in 1894 and extensively revised in 1938. This superseded the original constitution of 1777. The governor is elected by the people for a four-year term; senators are elected every two years; and members of the assembly, annually.

The State's Great School System

New York State's educational system had its beginnings in the schools established by the early Dutch settlers at their important trading posts by the middle of the 17th century. Today, in addition to a splendid public school system, opportunities for higher education are offered in all parts of the state. Teachers are trained in state colleges at Buffalo and Albany and in nine normal schools. Columbia University, at first King's College, 1754; Fordham University, 1841; College of the City of New York, and its affiliated Hunter College for women, New York University, Manhattan College, College of Mount Saint Vincent, College of the Sacred Heart, Cooper Union, Long Island University, Polytechnic Institute of Brooklyn, Pratt Institute, St. Francis College, St. Joseph's College for Women, and St. John's University, all are in New York City. Cornell University, at which the state maintains Colleges of Agriculture and Home Economics, is at Ithaca; Syracuse University, with the State School of Forestry, Syracuse; University of Rochester, Rochester; University of Buffalo, D'Youville College, and Canisius College are in Buffalo; Union University, Albany; Adelphi College, Garden City; Hobart College, Geneva; St. Lawrence University, Canton; Alfred University, Alfred; Niagara University, Niagara Falls; Hamilton College, Clinton; Vassar College, Poughkeepsie; College of New Rochelle, New Rochelle; Elmira College, Elmira; Wells College, Aurora; Clarkson College of Technology, Potsdam; Rensselaer Polytechnic Institute, Troy; St. Bonaventure's College, St. Bonaventure; Houghton College, Houghton. The United States trains its army officers at West Point (see Military Academy, United States).



TOWER-TOPPED MANHATTAN~ *Metropolis of the Western World*

"Downtown" New York, from Governors Island, with a Coasting Steamer in the East River

NEW YORK CITY. In size, wealth, industry, and commerce—in a hundred ways—New York is one of the two greatest cities in the world. Only half of the earth's nations have populations exceeding New York's 7,454,995 inhabitants. Its metropolitan area, which includes nearly 12,000,000 people, is larger than Greater London. Of all the nations of the Americas, only the United States has an annual budget exceeding that of this giant city. New York's imports and exports exceed those of any other port in value. The city is the richest in the world, with hotels and homes of amazing luxury. Yet by walking a few minutes from the city's richest districts, one can find some of the most squalid, poverty-ridden tenements in America.

Most visitors think that by seeing the "mid-town" district of hotels, shops, and theaters on Manhattan Island, they are "seeing New York." Actually this district, immense and rich as it is, counts for about as much as one block or so on "Main Street" in an average town. A better way to start understanding this giant among cities is to take a ferry to Bedloe's Island in the harbor and go to the top of the Statue of Liberty—the colossal copper figure created by F. A. Bartholdi and presented

by the people of France to the United States in 1886. From the room in its head—a room large enough to hold 40 people comfortably—a wonderful panorama is spread out—

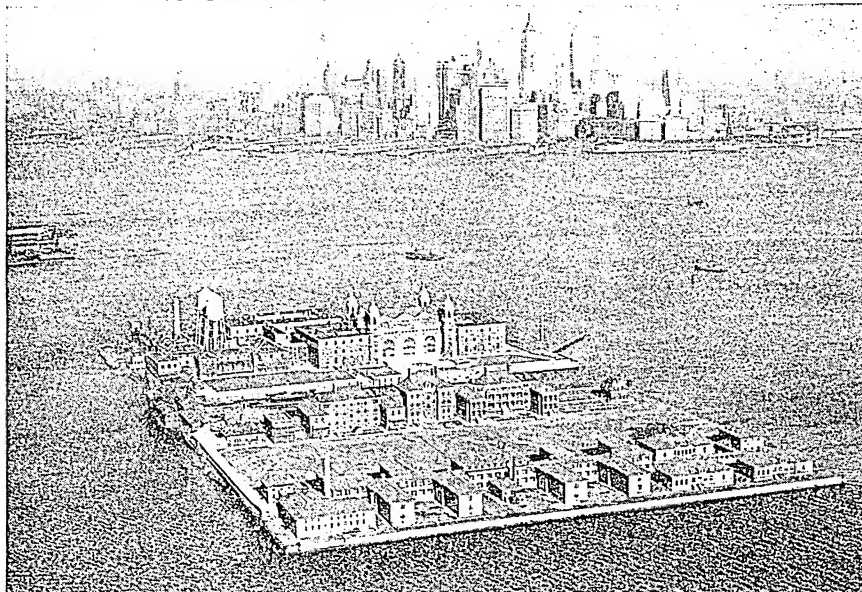
She that sits by the sea, new-crowned with a fivefold tiara;
She of the great twin harbors, our lady of rivers and islands;
Tower-topped Manhattan,
With feet reeded round with the masts of the five great oceans,
Flowering the flags of all nations, flaunting and furling,—
City of ironways, city of ferries,
Sea-Queen and Earth-Queen!—*Richard Hovey.*

In Hovey's poem, with its mention of ships, and in the scene before us, we find the reasons for the greatness of "Manhattan," as the whole city is often called, though the name properly belongs only to the island that is its heart. Around us lies a magnificent land-locked bay, linked at the south to the Atlantic through The Narrows between Long and Staten Islands. To the northeast, the East River connects with Long Island Sound and the waters skirting New England. To the north the Hudson River pierces far inland; New Yorkers still call it the "North River" to distinguish it from the Delaware, the "South River" of early colonial days.

NEW YORK CITY HAS

About 7,500,000 people, of whom nearly one-third are foreign-born.
It has more Italians than Rome, more Irish than Dublin, more Germans than Bremen, and one-tenth of all the Jews in the world.
Almost as many telephones as London, Paris, Berlin, Leningrad, and Rome combined.
Nine of the world's great bridges.
About 60 daily newspapers.
About 700 theaters and photoplay houses.
More than 1,500 churches of all denominations.
Taxable property valued normally at more than \$16,000,000,000.
More than 100,000 visitors a day.
A passenger train arriving every 52 seconds.
A wedding every 7 minutes, and a birth every 5 minutes.
Manufacturing output to the annual value of between 3 and 5 billion dollars.
An underground aqueduct big enough to carry drinking water for the whole world.
Grand Central Station, which contains 79 acres of space on two levels and can accommodate 30,000 at a time (cost \$150,000,000).

THE IMMIGRANT'S FORMER GATEWAY TO AMERICA



Here we see Ellis Island, where in former years a million people might be given entrance to the "promised land," gleaming so temptingly across the bay. Three large windows in the building with the "pepper pot" towers mark the detention room, where newcomers once underwent examination. Now examinations are made at consulates abroad, and most immigrants do not pass through the island. To serve those detained for any reason, the building has comfortable lounges, a nursery and other facilities for children, a pipe organ, movies, and radio. Other buildings are hospitals and quarters for the staff or for undesirable aliens awaiting deportation. Beyond the island we see Manhattan Island, with Battery Park on its tip and the East River behind.

In all, New York City has 578 miles of waterfront. Sea contacts, and a population that was cosmopolitan from the first, explain the early love of amusement and fun which caused Washington Irving in his 'Salmagundi' to dub the city "Gotham," after an English village noted for frivolity.

Facing north, we see another "gateway"—Ellis Island, which once admitted a large portion of all immigrants coming to America. The present immigration laws have greatly reduced its work (see Immigration). To the west we see thriving cities of New Jersey; but the great mass of Staten Island to the southwest belongs to New York state and city for an interesting reason. King James II had decreed in 1688 that all islands in the bay which could be circumnavigated in 24 hours should belong to New York. Capt. Christopher Billopp worked a boat through Kill van Kull and Arthur Kill to circle Staten Island in one day.

We cannot see much of the East River, which is really a strait three-fourths of a mile wide, between Manhattan and Long Island. Since the rocks were blasted from Hell Gate toward its north end in

1885, it has been much used by coasting steamers. Midway in its course is Welfare Island (once Blackwells), site of a city prison. Randalls, Wards, and Rikers islands have other institutions. At the "mouth" of the East River lies Governors Island, once the home of colonial governors, now used by the army.

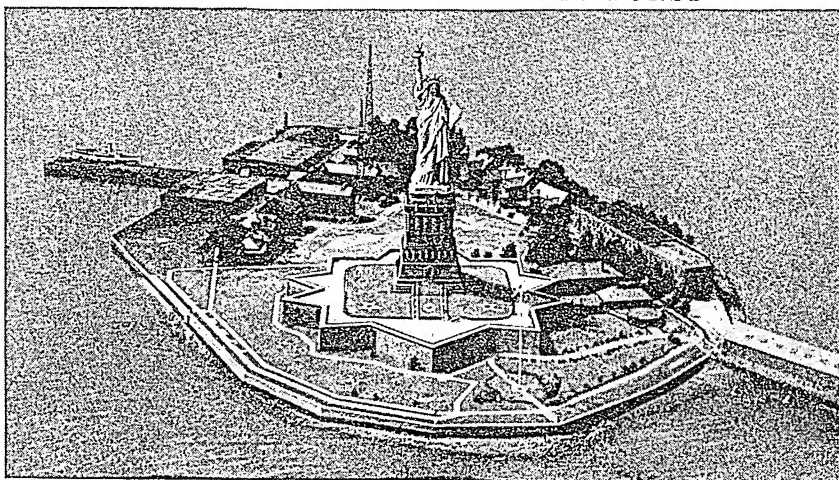
Giant Brooklyn

Across the bay to the east is the vast stretch of Brooklyn, on Long Island. Many visitors ignore this, except for Coney Island, the amusement resort jutting into the Atlantic at the tip of Long Island (see Coney Island). Yet if Brooklyn were an independent city, it would be the third largest in America, surpassing Philadelphia. Brooklyn has great

industries and immense areas of tree-shaded homes. Armies of workers cross to Manhattan every day by the three giant bridges and the subway tubes that link Brooklyn to Manhattan over and under the East River (see Brooklyn).

When we return to Manhattan, we land at The Battery on its tip. Battery Park is a 21-acre open site once occupied by fortifications. Here for more than a century was one of the landmarks of New York, a great round structure built in 1807 as a fort.

LIBERTY ENLIGHTENING THE WORLD



Incoming travelers by sea cannot miss the Statue of Liberty, rising above old Fort Wood on tiny Bedloe's Island, over against "the Jersey side." From a ship, one sees only the towering statue; but this airplane view shows interesting details of the fort as well. The star-shaped walls, which originally provided defense against attack from any angle, make a wonderfully appropriate shape for mounting the statue, since stars figure so prominently in the national flag.

Later this became an auditorium, Castle Garden, then an immigrant station, and finally an aquarium. The aquarium was vacated in 1941 when the park was torn up for a Brooklyn tunnel.

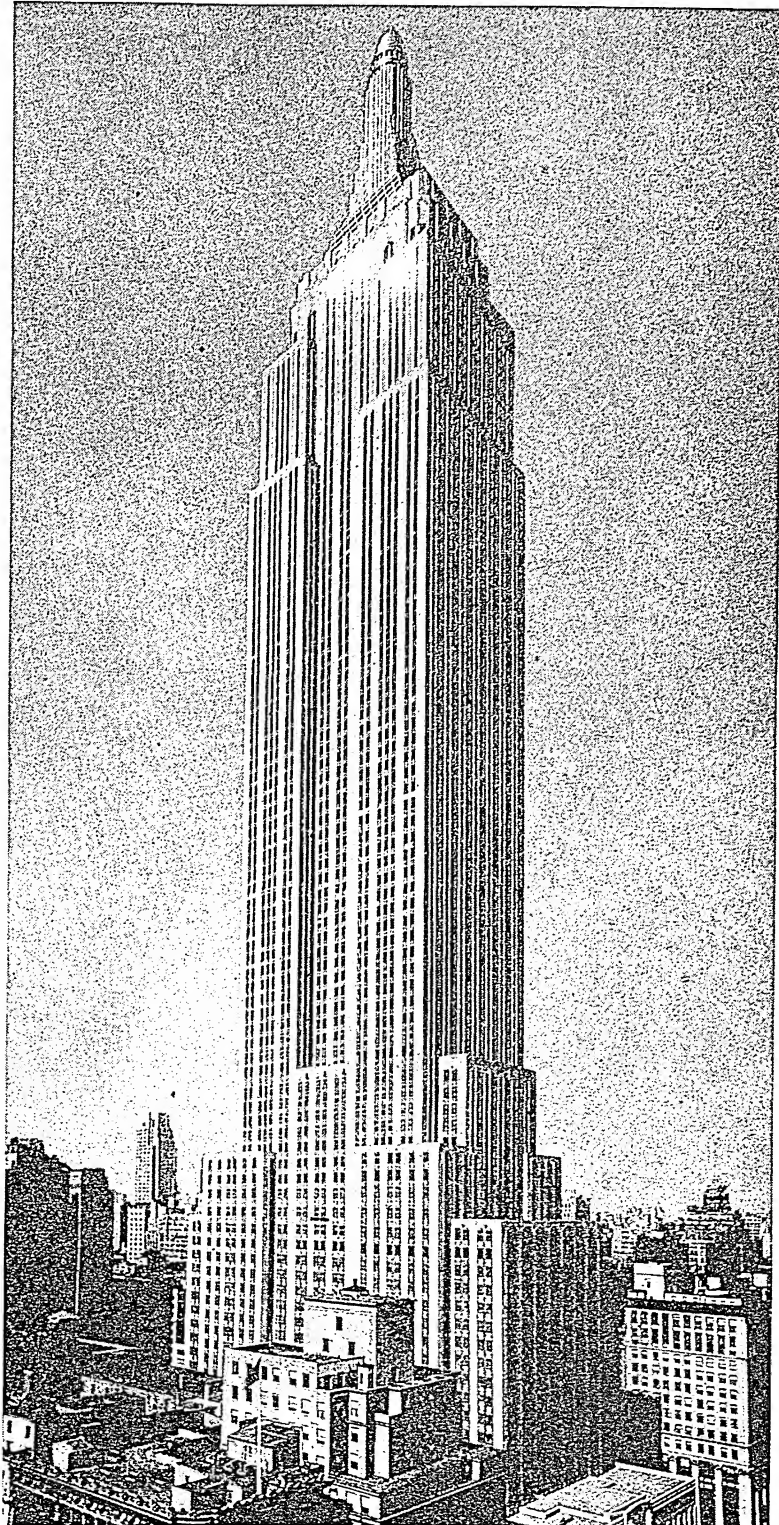
Crowded Manhattan

Manhattan Island is only $12\frac{1}{2}$ miles long and between 1 and $2\frac{1}{2}$ miles wide. One can walk across it in half an hour. Its area of $22\frac{1}{2}$ square miles is only a small part of the city's 323 square miles. Yet a quarter of the city's total population live here, closely crowded in lofty apartment buildings. The average square mile houses 84,000 people—nearly four-fifths as many as live in all Nevada. In addition, about a million people daily come here to work from suburban homes in three states. To these millions of permanent residents and suburban workers must be added the scores of thousands of visitors who arrive every day. About 63 per cent of the area is residential, 23 per cent business, and 14 per cent is given over to parks and playgrounds.

To house the business activities of these throngs, Manhattan has the highest skyscrapers in the world, topped by the tallest man-made structure of all, the towering Empire State Building. Such building was made easier by the fact that the island is solid rock to within a few feet of the surface.

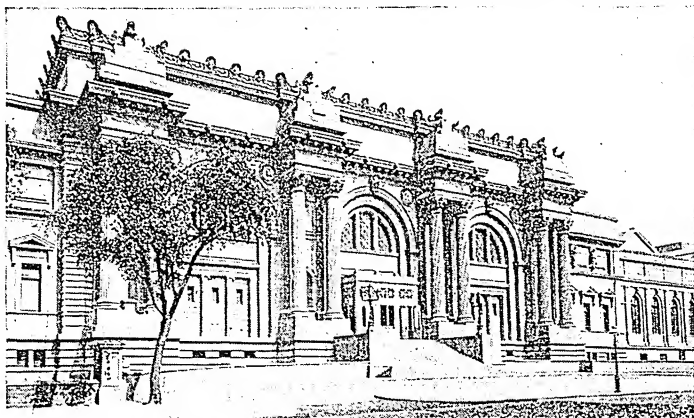
The shape and "street layout" of Manhattan make it easy for us to make a survey of the island. The present street plan was devised in 1811, to provide orderly growth beyond the "crazy quilt" area of the old town. East-west streets, numbered northward, connected the two rivers; while about a dozen avenues, numbered from First Avenue on the east, ran north and south. This idea in city planning seemed sound at the time, when everyone thought that industry would hug the river banks, and people would move east or west in going to and from work. Actually, the unforeseen and tremendous growth of New York has thrown most of the traffic burden on the few north-and-south avenues. In

THE "EMPIRE STATE" SOARS SKYWARD



Higher than the Eiffel Tower, the Empire State Building, with gleaming metal "ribs" containing its windows, soars 1,250 feet above Fifth Avenue and Thirty-fourth Street. It was completed in 1931, and its 102 stories can house 25,000 office workers.

THREE NOTED LANDMARKS OF MANHATTAN



modern times the city has been compelled to spend hundreds of millions of dollars in efforts to remedy this old fault in city planning.

Manhattan's Crowded "Downtown"

The visitor who wants to find his way about Manhattan needs to remember only one street in addition to the numbered streets and avenues already mentioned. This street is Broadway, starting at the tip of the island and running north and a little east to become, far beyond the city, the "Albany Post Road" to upper New York State. Nearly all Manhattan is within a few blocks of Broadway.

We can start our tour of Manhattan, therefore, where Broadway starts—at Bowling Green. This is a little park adjoining Battery Park on the spot where Dutch settlers had a smooth grass plot for playing bowls. Here we are in a shipping district, with steamship offices, the Custom House, and foreign consulates.

About a quarter-mile north, we come to Wall Street, running east from Broadway, where a Dutch wall once kept out Indians. Opposite its end is Trinity Church, with the graves of Alexander Hamilton, Robert Fulton, and other notables in the churchyard. One block to the east is "the narrow street called Broad," which becomes Nassau Street north of Wall.

Here at the corner of Broad and Wall we are in the "financial heart" of America. On the northeast corner is the United States Subtreasury building, with a statue of George Washington on its steps. On the southeast corner is J. P. Morgan & Co., housed in a building no larger than many country banks. The New York Stock Exchange is on the southwest corner.

A few blocks farther north we come to Maiden Lane and John Street, headquarters of the wholesale jewelers. In John Street we see diamond merchants trading with one another, many carrying fortunes in loose stones in

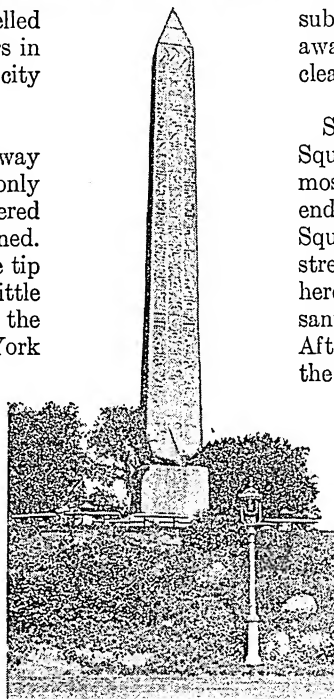
their pockets. Our next point of interest, a few blocks north, is City Hall Square. In Revolutionary days this was an open common on the edge of town. Here are the City Hall and the County Building, in colonial style. They were long since outgrown, and most of the city's office work is done in the Municipal Building at the northeast corner of the square. Flanking it to the south is the west end of Brooklyn Bridge.

At night, downtown New York is "deserted as the tomb." In most cities, "downtown" is filled at night with pleasure-seekers. In New York, however, everything except business has long since moved "uptown." Every afternoon the subways honeycombing the district whisk away all workers, like some giant vacuum cleaner.

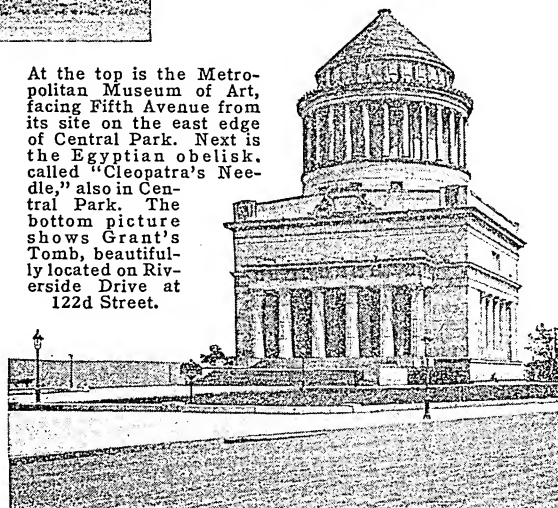
The Lower East Side

Slanting off northeast from City Hall Square is Park Row—once the home of most New York newspapers. Park Row ends after a quarter of a mile at Chatham Square, alongside Chinatown. The famous street called the Bowery runs north from here. Its name comes from Peter Stuyvesant's *bowery*, or farm, which it traversed. After the Civil War the Bowery became the home of sailors and "down and outers"; so in those days Chatham Square, called "Five Points" from the streets meeting there, was one of the world's "toughest" spots.

East of the Bowery we can explore New York's East Side, with five- and six-story tenements housing a foreign-born population under conditions of poverty-ridden misery that beggar description. One feature



At the top is the Metropolitan Museum of Art, facing Fifth Avenue from its site on the east edge of Central Park. Next is the Egyptian obelisk, called "Cleopatra's Needle," also in Central Park. The bottom picture shows Grant's Tomb, beautifully located on Riverside Drive at 122d Street.



that attracts many visitors to the district is the Jewish ghetto centering on Hester Street.

Running north from City Hall Square is Centre Street, with the "Tombs," a county prison, connected with the Criminal Courts Building by the "Bridge of Sighs" over an intervening street. Broadway runs north and a bit west through a wholesale machinery district, where the numbered streets commence. A short detour west brings us to Washington Square, with its huge arch honoring George Washington.

Around the Square stand close-packed homes once inhabited by "the aristocracy." Now this quiet area has been invaded by the downtown buildings of New York University, some apartment hotels, and, to the southwest, "Greenwich Village." This is a district of tenements in which many artists and writers have settled.

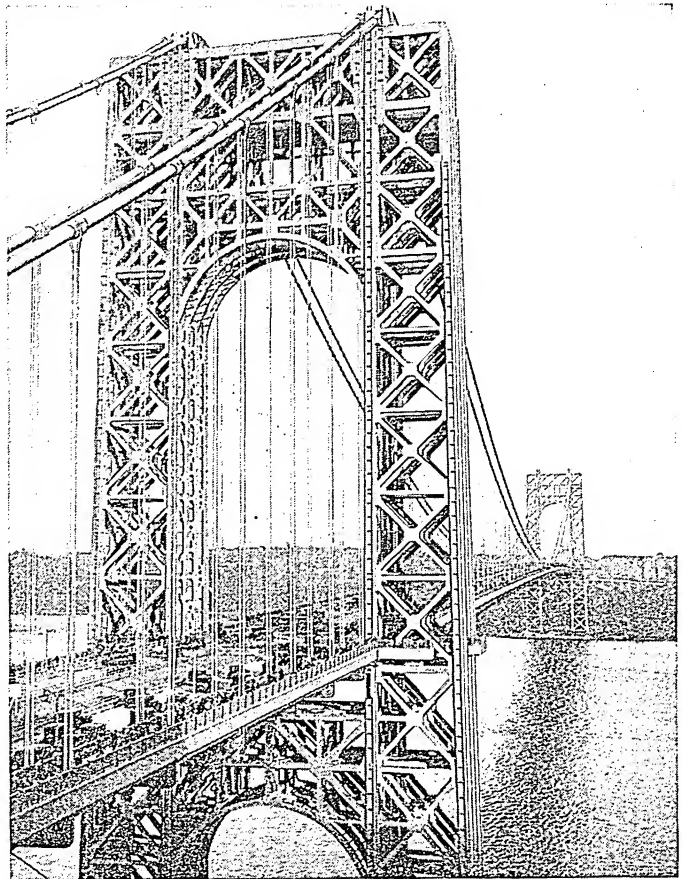
Beginning at Washington Square and running north we see Fifth Avenue, important to most women visitors because of its splendid shops. We follow it north to where we meet the diagonal swing of Broadway at 23d Street. Here is Madison Square. Toward the end of the 19th century, this was the heart of "gay life" in New York, with its hotels and amusement places. Today the clothing industry has swamped the region, and spreads up Broadway and to the west, almost to the new amusement zone beginning at 42d Street. The resulting loss in real estate values was one reason for New York's zoning law, which bars factories from residential and commercial districts. Looking back from Madison Square down Broadway to Fourteenth Street, we see an old-time shopping center, with its stores featuring "bargain merchandise." There also is the famous Union Square, the traditional spot where agitators are allowed to air their views. After crossing Fifth Avenue, Broadway leads to the largest department stores in the city, and probably in the world, at 34th Street. One block west of Broadway, between 32d and 33d, is the huge Pennsylvania Railroad station, backed by one of New York's principal postoffices.

Many Features of "Midtown"

Returning at this point to Fifth Avenue, we find ourselves entering "midtown" New York, another region of skyscrapers. At 42d Street we come to the Public Library, with which the old Astor Library and the Tilden Foundation are combined. Here are some 2,500,000 volumes, and many priceless collections, such as the Lenox Library rarities.

Two blocks east of the Library is the Grand Central Railroad station. The first station here was built after the Civil War by Commodore Vanderbilt. He had a terminal near Madison Square, but when corrupt politicians tried to extort money from him for franchise

THE COLOSSAL GEORGE WASHINGTON BRIDGE



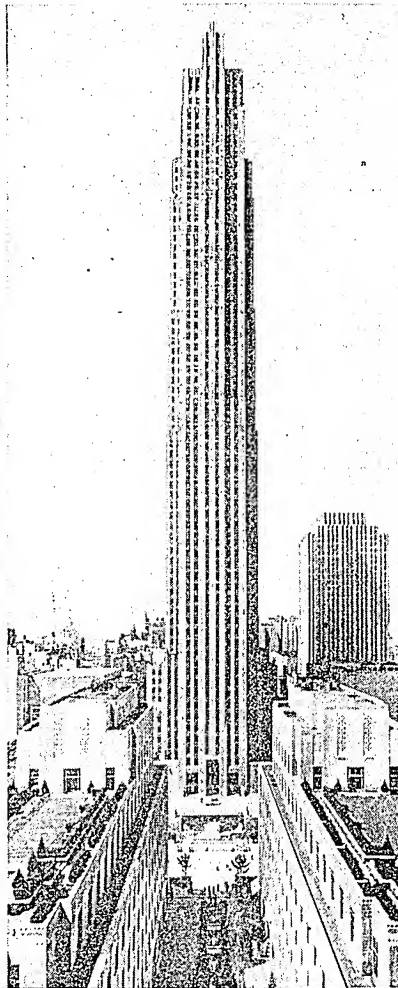
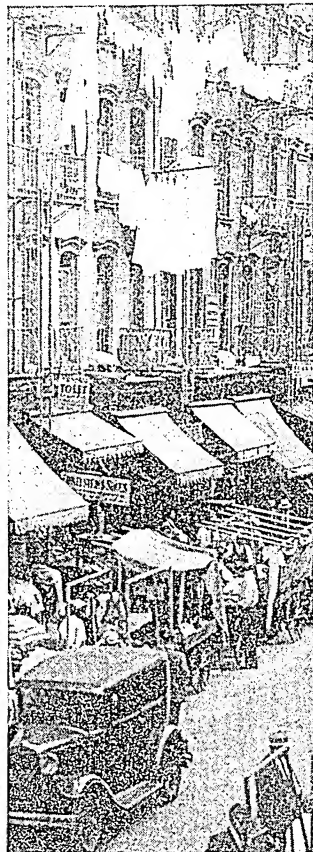
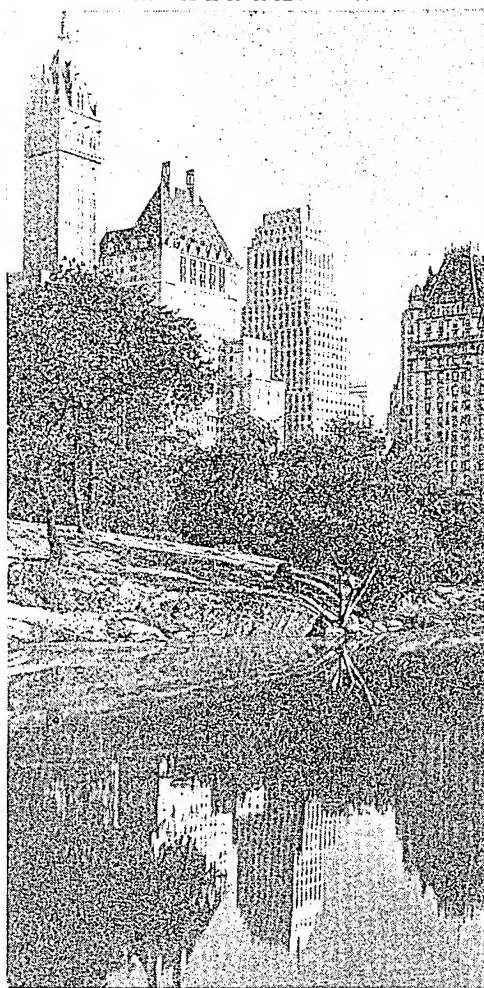
This tremendous span bridges the Hudson from the Fort Lee district in New Jersey, where we stand, to the Fort Washington district of upper Manhattan. The two forts were built in 1776 to hold the Hudson against the British. The bridge, which has a 3,500-foot span, cost \$60,000,000.

privileges, he built a new station at 42d Street, which was then far uptown, and said that he "would bring the city to the trains." When the lines entering the Grand Central were electrified after 1906, the tracks, going north in Park Avenue, were roofed over as far as 96th Street; and Park Avenue became a fashionable hotel and apartment street.

If we continue north on Fifth Avenue, we pass St. Patrick's Cathedral at 50th Street, opposite the huge Rockefeller Center group of buildings. At 59th we come to Central Park, which is bounded on the east by Fifth Avenue. Another interesting route from 42d Street and Fifth Avenue takes us west again to where Broadway crosses 42d Street and Seventh Avenue at Times Square. Here beneath our feet is probably the busiest subway station in the world, with four lines crossing at different levels. Times Square is the center of the amusement district. Theaters cluster so thick along the square and the adjoining streets that at night people and vehicles can hardly move.

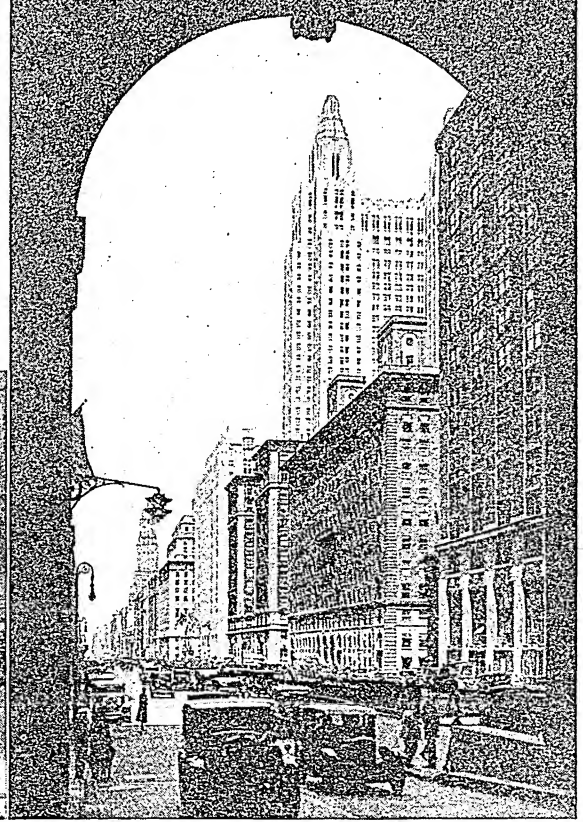
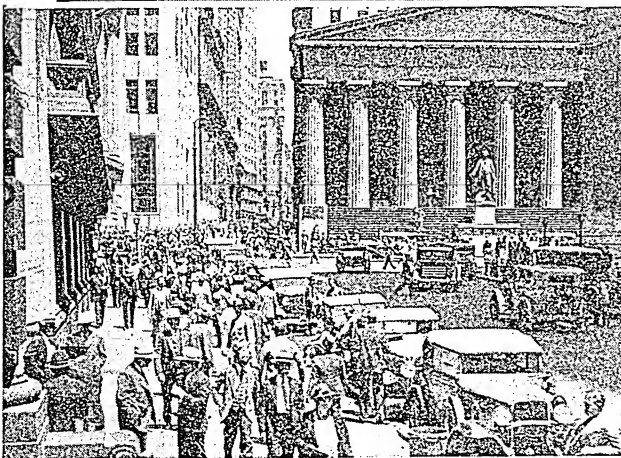
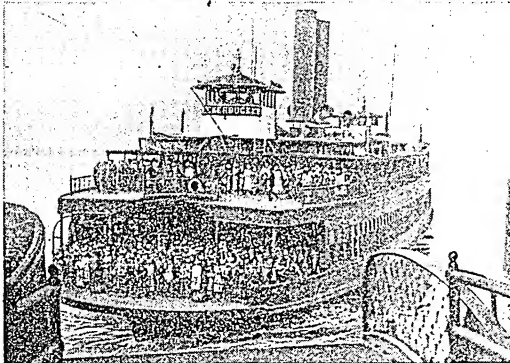
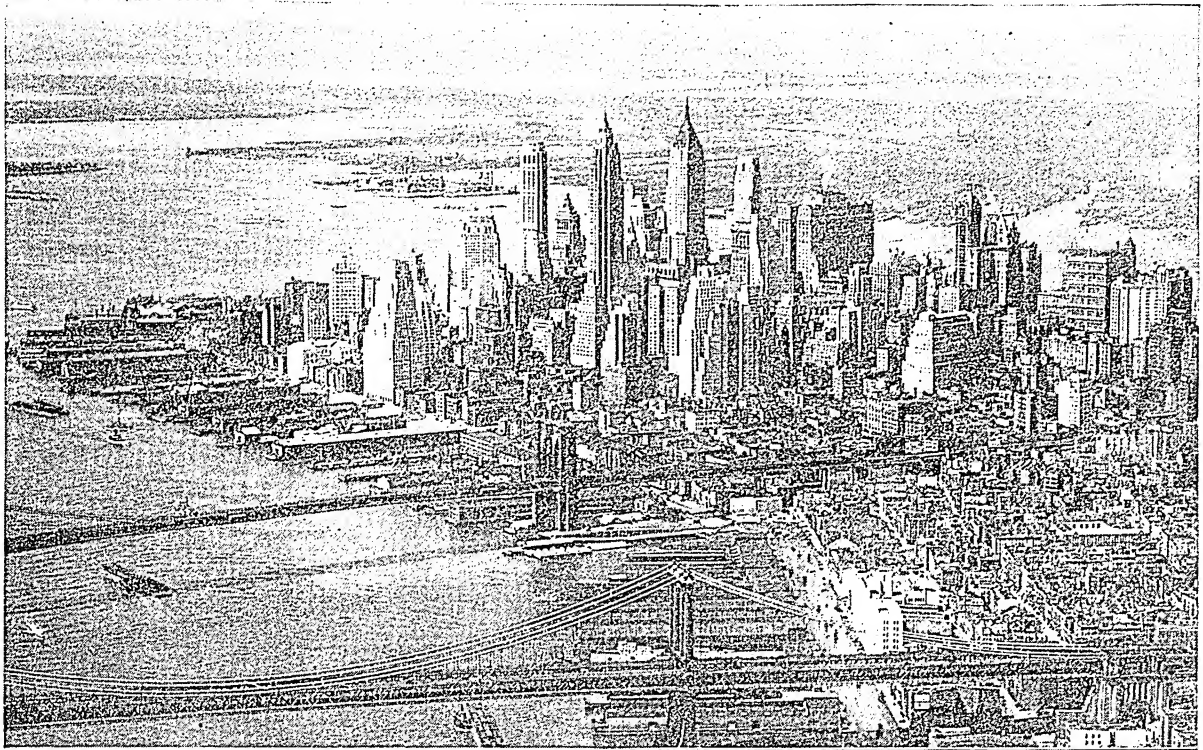
At 59th Street and Columbus Circle, Broadway crosses Eighth Avenue and also touches the southwest corner of Central Park. Above 59th Street Manhattan

A LITTLE TOUR AMONG THE MANY FASCINATING



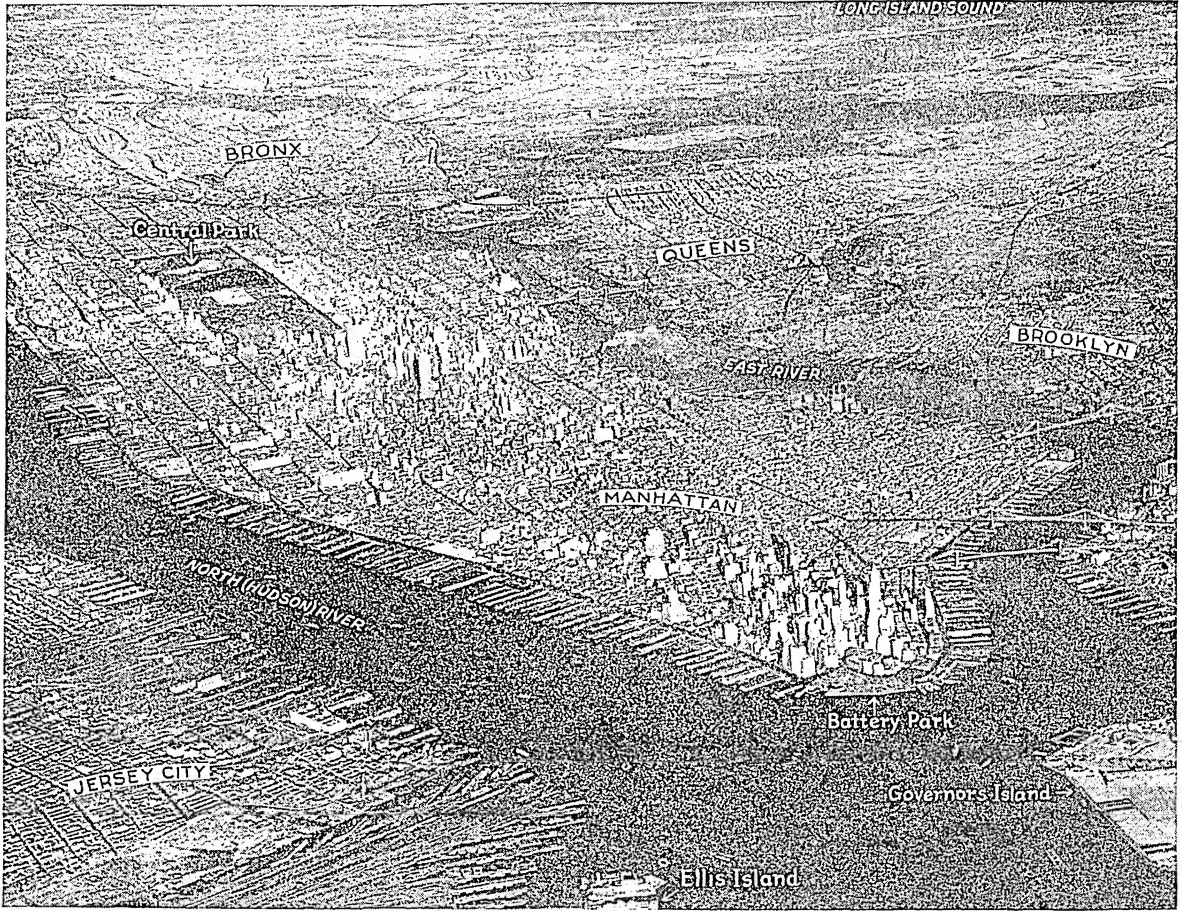
New York City's never-ending contrasts are well exemplified by the view showing a bit of Central Park overlooked by a group of luxurious hotels and an office building at 59th Street and Fifth Avenue. Yet a few blocks away we can find dire poverty, as in the East Side scene, with its pushcarts and washing hung over the street. The tall building in the upper right-hand picture is the dominating feature of Rockefeller Center. We view it from Fifth Avenue, over costly open space provided for light and air. In the bottom picture, Broadway at the left and Seventh Avenue at the right run north from Times Square in all their night-time glitter.

SCENES OF NORTH AMERICA'S GREAT METROPOLIS



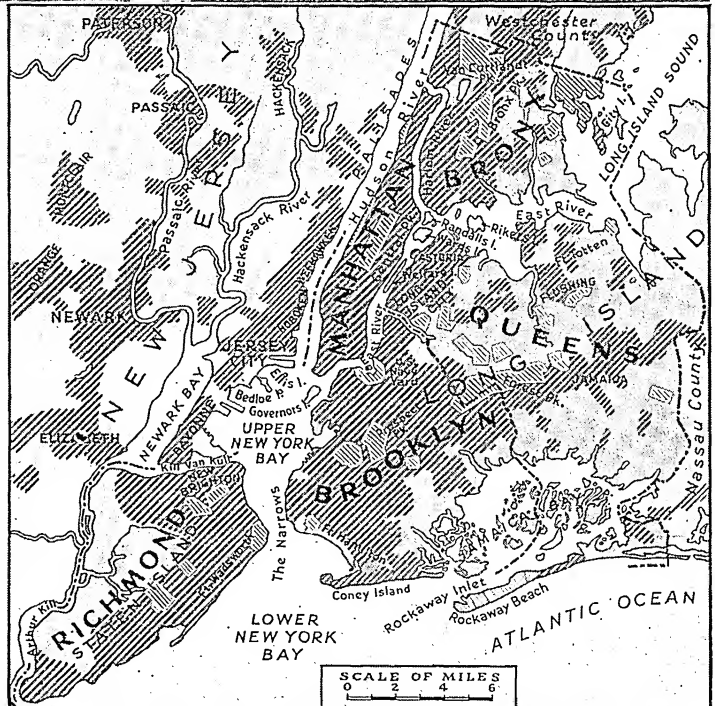
At the top we look from the northeast across "downtown" and the Hudson River toward New Jersey. In the foreground is Manhattan Bridge, with Brooklyn Bridge beyond. Note the many steamer piers, and observe how the tenements of the lower East Side, although several stories high, are overshadowed by the approaches to the mighty bridges. In the ferry picture we see Staten Islanders coming to work, and below we look at the Subtreasury Building in the heart of the Wall Street district. Finally, we get a glimpse of fashionable Park Avenue where it tunnels through an office building and leads to an elevated ramp flanking Grand Central Station.

HOW THE AIR MAN AND THE MAP MAN SEE NEW YORK



The airplane view shows superbly the principal features of the city's geography, with Manhattan Island in the center. "Midtown" is just south of Central Park. In the map below, heavy shading indicates the densely populated areas.

becomes definitely residential, although the blocks are still built solid with almost no trees or grass. At 116th Street, Broadway crosses the campus of Columbia University (established as King's College in 1754). Some 70 buildings of the university are grouped on Morningside Heights. Near by is the magnificent Protestant Episcopal Cathedral of St. John the Divine. This has been under construction since 1892, and was planned to be the largest Gothic cathedral in the world. Another interesting trip in upper Manhattan is on Riverside Drive, from 72d Street north along the high bluff overlooking the Hudson, to the George Washington Bridge at 178th Street. Parallel to it, lower and nearer the river, is the Henry Hudson Parkway. This express drive connects with the elevated West Side Highway and runs north to the Westchester County line.



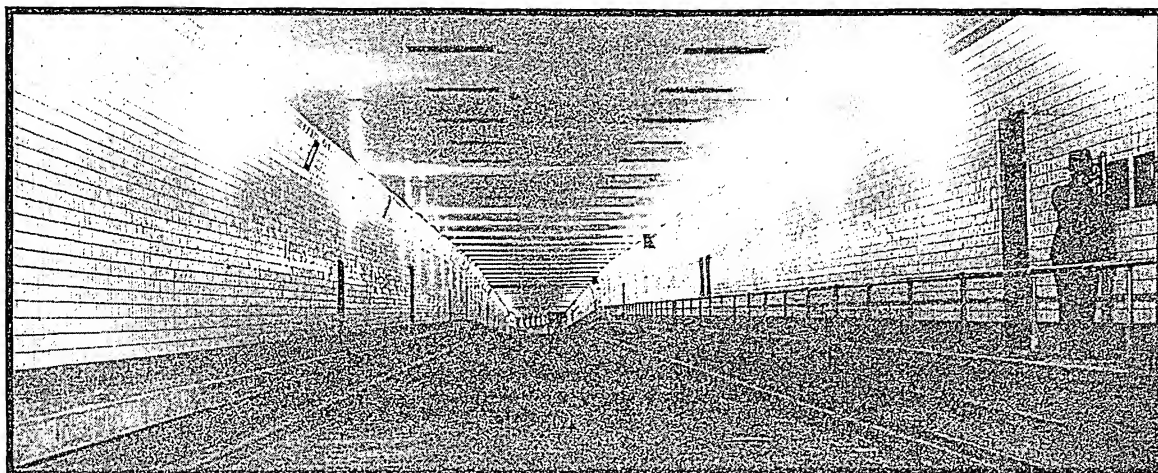
Most famous of New York's parks is Central Park, with the American Museum of Natural History adjoining it on the west. The Bronx, to the northeast of Manhattan, has Van Cortlandt Park; Bronx Park, noted for its zoo and botanical gardens; and Pelham Bay Park, with eight miles of water front. Prospect Park is the greatest in Brooklyn. On the site of the World's Fair (1939-40) is Flushing Meadow Park.

Other nations and states have contributed far more to New York's population than has "Gotham" itself. Even if by some chance every person whose parents

leges, including Teachers College and Barnard College (for women); New York University, with its Hall of Fame (*see* Hall of Fame); and Fordham University (Catholic, for men). Cooper Union is one of the country's best-known technological institutions. Scores of other schools provide specialized instruction.

The greatest problems which have confronted New York are those of water supply and transportation. The former was solved by the building of the 92-mile Catskill Aqueduct, one of the most stupendous engineering projects ever completed (*see* Aqueduct).

MOTOR TUNNEL LINKS NEW YORK AND "JERSEY"



On a busy day 50,000 motor vehicles pour through this tube and its twin which form the Holland Tunnel under the Hudson River between New York City and Jersey City. Blower fans in those ceiling vents change the air automatically 42 times an hour, or oftener when "robot" electrical devices warn the engineers in charge that the air is dangerously heavy with exhaust gases. The tubes are 9,250 feet long—nearly two miles. Emergency phones hang along the walk on the right.

were born in America were to leave the city, it would still be larger than Chicago and Philadelphia combined; for three-fourths of its people are foreign-born or are the children of foreign-born. There are well-defined foreign communities in the city, such as "Little Italy," "Chinatown," and Jewish, German, French, Russian, Greek, Negro and Armenian quarters. Not only does each nationality tend to hold together by itself, but Sicilians flock together apart from other Italians, and whole blocks are inhabited exclusively by immigrants from this or that Sicilian town or village. In such districts the Old World customs are preserved little changed and the task of Americanization is made very difficult.

It is a huge task to replace the 70 or more tongues of New York's immigrants by English and fit the boys and girls for useful places in the community; and if it were not that New York is so rich—with assessed values greater than those of the next seven cities in America combined—the task would be hopeless. In addition to elementary and high schools which provide for over a million pupils, the city maintains the College of the City of New York. This comprises City College (for men), Hunter College (for women), Brooklyn College, and Queens College. In New York are also Columbia University with its affiliated col-

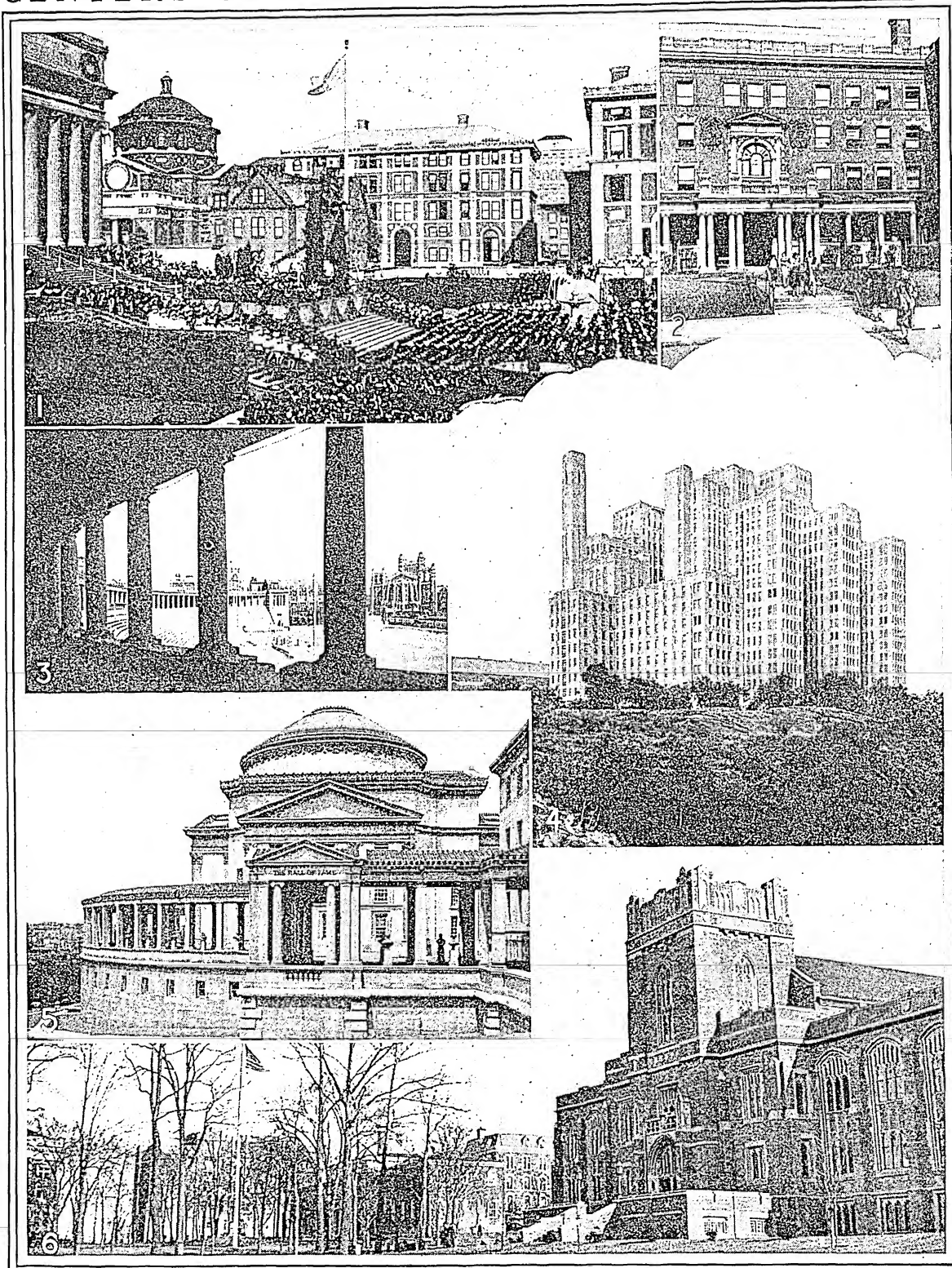
The city now receives nearly a billion gallons of water a day. Future needs will be met with an aqueduct from the Delaware River, to be completed in 1948.

Traffic and Transportation Problems

Providing adequate transportation is a never-ending problem. The local facilities provide more than 3 billion rides a year, or enough to give 25 rides to every person in the United States. Railroads and ferries provide nearly 300 million more rides for visitors and commuters. As early as 1870 Manhattan had its first elevated railroad; in 1904 the first subway was completed. Today the island is honeycombed with municipally owned subways, which have replaced nearly all the elevated lines of earlier days. In Manhattan, street cars are disappearing year by year, giving way to the more convenient and flexible motor bus. Express motor highways girdle the city. Along the west edge of Manhattan and through the Bronx is an elevated highway, and along the east edge is the East River Drive. Across East River, the 32-mile Belt Parkway skirts Brooklyn and Queens.

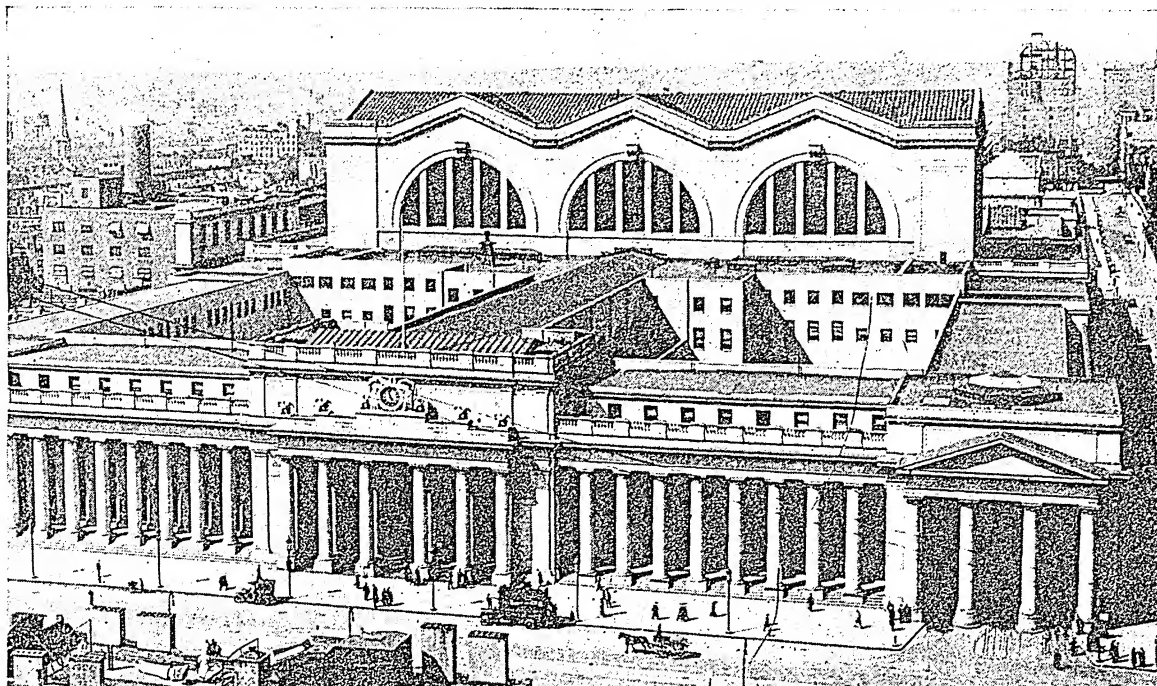
Vehicles and rapid-transit trains cross the East River on the Brooklyn, Manhattan, Williamsburgh, and Queensborough bridges. The Triborough and Bronx-Whitestone bridges accommodate vehicles. Tunnels are provided for subway and railroad trains,

CENTERS OF LEARNING IN NEW YORK CITY



1. Columbia University campus on Morningside Heights. At the commencement exercises pictured here more than 5,750 degrees and diplomas were awarded. 2. Milbank Hall is part of Barnard College for girls, affiliated with Columbia. 3. Lewisohn Stadium and the English Gothic buildings of the College of the City of New York are seen through a colonnaded porch. 4. Columbia's medical school, a modern skyscraper on the Hudson above 165th Street, is the nucleus of a great medical center. 5. In the Hall of Fame of New York University in the Bronx, bronze tablets honor famous Americans. 6. Fordham University, conducted by the Jesuit order in the Bronx, is one of the largest Catholic educational institutions in America.

THE PENNSYLVANIA STATION IN NEW YORK CITY



We see here, in this station of the Pennsylvania Railroad in New York City, how beautiful and impressive a railway station may be. It has some of the features of a Greek temple; and Mercury, the god of commerce and swift travel, might well accept it for his own. This is one of the largest stations in the world. The lines which feed it pass under the Hudson and the East rivers.

and the Midtown-Queens vehicular tunnel was opened in 1940. At North Beach, in Queens, is the municipal airport, La Guardia Field. This \$40,000,000 airport, opened in 1939, is the eastern terminus of all leading American air lines, and its seaplane base is the western terminus of the transatlantic clipper ships.

The George Washington Bridge connects Manhattan with New Jersey. Motor vehicles can also use the Holland Tunnel, completed in 1927, or the Lincoln Tunnel, opened in 1937. The Hudson tubes, opened in 1908 and 1909, carry passengers between Manhattan and New Jersey cities as far as Newark. Staten Island is connected with Manhattan by ferry, and with New Jersey by three huge bridges. Most of the western railroads stop on the west bank of the Hudson, but tunnels provide an entrance to the Pennsylvania Terminal on Manhattan. Railroads from the north and northeast use the Grand Central Terminal.

New York's Leadership in Business and Finance

Through New York's harbor, one of the finest in the world, passes about 40 per cent of the foreign trade of the United States in merchandise, and the lion's share of the nation's foreign travel. New York is also a great world-center of finance, with banking transactions running each year into the hundreds of billions. Here are the country's most important "exchanges," including the Stock Exchange, the "Curb," and the Cotton Exchange, as well as the most powerful banks and trust companies and the great New York Clearing House.

New York's financial and commercial interests are on so enormous a scale that they overshadow its great manufacturing industries. But about 10 per cent of the manufactured goods of the nation are produced in New York City—in some years more than in Detroit, Philadelphia, Cleveland, and St. Louis together—and almost 90 per cent of the industries of the entire country are represented there. In addition to its commercial advantages, New York is but a short distance from the coal and oil of the Appalachian fields. It has been further aided by the large supply of immigrant labor, which was a great factor in giving it the lead in the manufacture of wearing apparel. Almost half the clothing worn in the country is made in New York City. The printing and publishing industry is largely concentrated here, ranking second to clothing in value. Other leading manufactures are bakery products, meat packing, foundry and machine shop products, sugar refining, millinery, leather goods, boots and shoes, tobacco manufactures, furniture, paint and varnish, and toilet accessories.

The Dutch West India Company occupied the site of New York with a fur trading post in 1614, five years after Henry Hudson's voyage up the river. After the Dutch had secured permission from the Indians to settle on Manhattan Island for the equivalent of \$24, they named the island New Amsterdam. The early history of the city, from the days of Peter Stuyvesant to the start of the Revolution, is practically the history of the state. (See New York State.)

BURROWING UNDERGROUND WITH NEW YORK'S CROWDED MILLIONS



Above is a station platform and a few "many-doored" cars on the independent system which the city itself operates. With all these doors, the train empties almost instantly. At the left is a typical subway jam, everyone trying to get on and off at once. The train contains "L" cars, and stands at one of the stations where "L's" and subways interchange passengers.



New York City was prominent in the movement which led to American independence. The Stamp Act Congress (1765) met here, and organizations of Sons of Liberty opposed by violence the sale of stamps, as well as later shipments of tea. The city was occupied by the British armies during the whole of the war, and was a chief refuge for Loyalists. Before the Revolution New York was outranked by both Boston and Philadelphia in commerce; but after the British evacuation (Nov. 25, 1783) New York forged rapidly to the front. Trade with China was begun, and by 1788 a hundred vessels or more might be seen in port at the same time. The opening of the Erie Canal in 1825 improved its westward outlet for goods and definitely insured New York's commercial supremacy. A great fire Dec. 16-19, 1835, destroyed the entire East Side below Wall Street.

New York was the capital of the colony and state until 1797, and in 1789-90 it was also the capital of the Federal government under the new Constitution. In the Civil War the mayor, Fernando Wood, was a Southern sympathizer; and while the city sent large numbers of its native and foreign-born citizens to swell the Union ranks, the disloyal and rowdy element in 1863 caused disgraceful "draft riots," in which \$2,000,000 worth of property was destroyed and 1,200 rioters were slain. In 1863-71 the notorious "Tweed ring," through the political organization known as

Tammany Hall, plundered the city until its head, Wm. M. Tweed, was imprisoned. A World's Fair was held in 1939 and 1940 (see Fairs and Expositions).

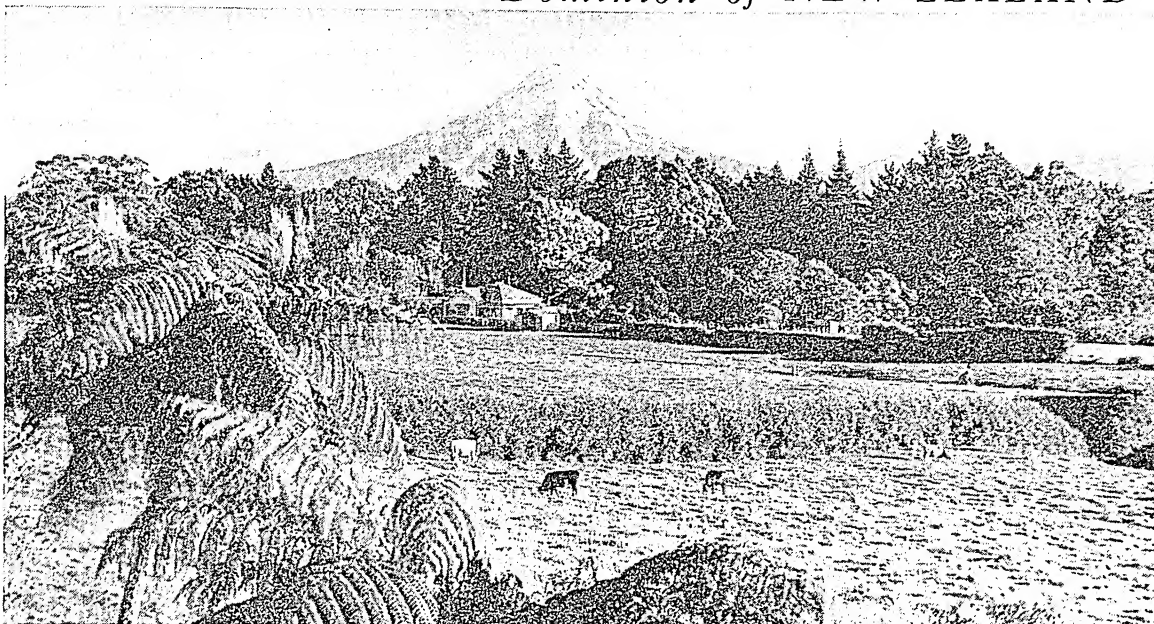
New York's Many Intertwined Governments

New York City spends more money and has a more complex administration than any other governmental unit in the country, with the exception only of the Federal government. The metropolis has overflowed five counties, each of which retains its county organization. Each of the county areas is also organized as a "borough," which exercises self-government in certain matters. The city first took in all of Manhattan Island, comprising New York County, and in 1874 and 1895 it absorbed the present Bronx County. Under the Greater New York charter of 1897 it took in Kings and Queens counties on Long Island and Richmond county on Staten Island. The boroughs corresponding to New York and Kings counties are called Manhattan and Brooklyn boroughs; the other boroughs have the same names as the counties.

A new charter was adopted in November 1936, and became effective Jan. 1, 1938. By its provisions, each borough has an elected president and local improvement board, with power to authorize limited expenditures for such improvements as street and sewer repairs. The city, through its many departments, controls all other municipal affairs, such as schools, parks, health, fire and police protection, housing conditions, and construction of public works.

The chief executive is the mayor, who is elected for a term of four years. He is assisted by a deputy mayor. All law-making power is in the hands of a City Council. The members of the council, about 30 in number, are elected under a system of proportional representation by the boroughs. There is one councilman for every 75,000 votes cast within each borough. Most administrative matters are in the hands of the Board of Estimate, which directs and manages the business affairs of the city. It makes the budget and appropriates funds for large expenditures. The board is composed of the mayor, the five borough presidents, the president of the City Council, and the controller. On the Planning Commission depends the far-sighted and orderly program for the future development of the city. It consists of six members appointed by the mayor for overlapping terms of eight years, and the chief engineer of the Board of Estimate, who is a civil service employee.

The PROGRESSIVE Dominion of NEW ZEALAND



A Typical Farm Landscape. The Snowy Cap of Mount Egmont Dominates This Scene on North Island

NEW ZEALAND, DOMINION OF. To steam from London to New Zealand, the remotest of the British Dominions, a fast liner takes nearly a month. Even the nearest neighbor, Australia, is three days away by ship. (*See map with Pacific Ocean.*)

But none of the Dominions is more intensely British. Nine out of ten of its people are of British stock. On the other hand, no Dominion is more progressive, even radical, in its social legislation.

Its laws provide for old-age pensions, minimum wages, the 40-hour week, arbitration courts for labor disputes, unemployment insurance, loan banks for settlers, and federal housing (in state-owned houses). It controls prices and taxes wealth heavily. The state operates a system of life insurance and provides free medical and hospital care. Telegraph and telephone systems and nearly all the 3,500 miles of railroads are government-owned. Education is compulsory between the ages of 7 and 14. Women have had the vote since 1893.

The Two Chief Islands

Two islands, North Island and South Island, have all but a small fraction of the Dominion's total area and nearly all of its population. Together they cover an area of 103,415 square miles, about that of Colorado. Their population of 1,575,000 is about 40 per cent larger than Colorado's. They extend in an arc 1,100 miles long, and are nowhere more than 200 miles wide. Cook Strait, which separates them, is only 16 miles wide at its narrowest point.

Two-thirds of the people live on North Island, which is warmer and has more land suitable for farming than South Island, though it is somewhat smaller. For the most part they have settled near the coasts because the interior is cut up by rugged mountains. Only about 40 per cent live on farms and ranches. Almost as many are in the four principal cities. On North Island are Auckland, the largest city and the chief

port for foreign trade; and Wellington, the centrally located capital, on Cook Strait, the chief port for interisland commerce. South Island's principal cities are Christchurch, a typical English town, and Dunedin, which was settled chiefly by Scots and resembles Edinburgh both in appearance and in climate.

South Island is celebrated for its magnificent scenery of mountains, lakes, fiords, and tumbling rivers. It has the Southern Alps, with the Dominion's highest peak, Mount Cook (12,349 feet). Fifteen others in the range exceed 10,000 feet. North Island is less rugged but has picturesque volcanic peaks, notably Ruapehu (9,175 feet) and Egmont (8,260 feet). A wonderland of hot springs and geysers around Lake Rotorua reminds tourists of Yellowstone Park. The Waitomo Caves, to the west, are lighted by myriads of glow-worms. Many of the rivers are used to generate hydroelectric power.

Climate and Production

The mountains are always snow-capped, but the ocean gives the coastal lands a mild

FEATHERED CLOAK



Feathers of the rare kiwi adorn the priceless cloak of this Maori girl.

AUCKLAND—METROPOLIS AND CHIEF SEAPORT OF THE DOMINION



This is Auckland, the largest city, as viewed from the suburb of Devonport north of the entrance to Waitemata Harbor. This is one of the finest harbors in all the southern hemisphere and handles most of New Zealand's foreign trade.

climate. July is the coolest month, with an average temperature of about 50° F. on North Island and 42° on South Island. Live stock can live outdoors all year. In January and February, the warmest months, temperatures rarely exceed 85° F. Rainfall is plentiful and evenly distributed through the year.

Dense forests originally covered most of the Dominion, but now survive on only about one-fifth of it. Evergreens predominate. The kauri yields a valuable resin (*see Gums and Resins*).

About half the land is in farms and ranches. More than 95 per cent of this is used for grazing. Sheep outnumber the people more than 20 to 1. Cattle, pigs, and horses are also raised. Wheat, oats, and turnips are leading crops. Fruit trees thrive near the sea.

In proportion to population, New Zealand has a larger foreign trade than any other nation. Trade is chiefly with the United Kingdom and, on a much smaller scale, with Australia, the United States, Canada, and India. The grazing industries supply nearly all the exports, chiefly butter, frozen meat, wool, cheese, hides, and gold. Chief imports are motor vehicles, petroleum products, and machinery.

The processing of meat and dairy products is the chief manufacturing industry. Most of the manufactures supply only domestic needs, such as vehicles, lumber, furniture, clothing, shoes, and hosiery.

Mineral wealth ranks far behind farm wealth, though gold has been an important product since the 1860's. Coal, iron, silver, and tungsten are also mined.

History and Government

Abel Jansen Tasman, a Dutch sea captain, sailed into Golden Bay of South Island in 1642, but the hostility of the

natives prevented him from going ashore. The Dutch named the land after one of the Netherlands provinces.

The first man to explore the islands was Capt. James Cook (*see Cook, Capt. James*). The first settlement was made by missionaries in 1814. New Zealand became part of the British Empire in 1840, and the chief wave of colonists came in the ten years following the discovery of gold on South Island in 1861. By 1870, New Zealand's social and economic program was well under way. In both World Wars, New Zealanders served on many fronts.

Centuries of warfare with the whites reduced the numbers of the original inhabitants, the Maoris, until today the pure Maori stock makes up less than four per cent of the total population. Now, however, their numbers are growing, and many have married whites. They are a handsome race of Polynesian stock (*see Pacific Ocean*).

New Zealand has had representative government since 1852, and it has been a self-governing Dominion since 1907. A governor general represents the crown, but the real power is Parliament. This consists of an elected House of Representatives assisted by a Legislative Council appointed by the governor general. The prime minister and his cabinet are responsible to Parliament.

New Zealand also includes Stewart Island and the Chatham Islands. It has sovereignty over the Cook Islands, Niue Island, the Tokelau (Union) Islands, the Kermadec Islands, the Mandate of Western Samoa, and numerous uninhabited islands. These together make up an area of more than 105,000 square miles, with about 1,650,000 people. (*See also New Zealand in FACT-INDEX at end of this volume.*)

NEY (*nā*), MICHEL (1769-1815). "The bravest of the brave" was the title given by Napoleon to this one of his great marshals. Although of humble birth—the son of a cooper—Ney had become an under-officer in a hussar regiment by the beginning of the French Revolution. Promotion came rapidly, and at the establishment of the empire in 1804 Ney was made a marshal of France. His skill contributed to the victories at Jena in 1806 and at Friedland in 1807.

But it was in the Russian campaign that his bravery was most conspicuous. On the disastrous retreat from Moscow he protected the rear, encouraged the soldiers, and was himself the last to cross the Russian frontier. When the news of the escape of this "Launcelot of the Imperial chivalry" reached Napoleon, he exclaimed to his officers: "I have more than 400,000,000 francs in the cellars of the Tuileries and would gladly have given all to ransom my faithful companion in arms."

But a few years later Napoleon in his far-away prison-island, St. Helena, heard without emotion the news that Ney had been shot as a traitor. The reason for this change of attitude was that when Napoleon had been forced to abdicate, in 1814, Ney

had gone over to the royalists with loud protestations of devotion to the Bourbons. When Napoleon had returned from Elba, Ney had set out from Paris, boasting that he would bring this disturber of the peace back "in an iron cage," but when he had met his former commander, he and his whole army had joined the force of the enemy, and had fought for Napoleon at Waterloo. It was for this that he had suffered death, and it was because he had broken his faith both with Louis XVIII and with Napoleon that the exiled emperor condemned him as "dishonorable." The legend that Ney escaped to the United States and lived there many years before his death is without any historical authority.



NIAGARA FALLS. Anthony Trollope, the celebrated English novelist, once wrote that "of all the sights on earth which tourists travel to see," he knew of none "so beautiful, so glorious, and so powerful" as the falls of the Niagara River, about 22 miles northwest of Buffalo. Some people differ with him, pointing particularly to the Grand Canyon of the Colorado. Others call attention to the Victoria Falls in Africa and to the Iguassú Falls in South America, both of which are higher and wider than Niagara (see table in FACT-INDEX under "Waterfall").

But Niagara pours over its precipice a far greater volume of water than both these falls combined, and certainly in point of scenic splendor is one of the most sublime of the world's natural wonders.

Every minute of day and night about 15,000,000 cubic feet, or more than 465,000 tons, of water are leaping, vaulting, catapulting madly over their precipice. Tumbling as it were from the blue of the very heavens, the water avalanches hurl themselves with awe-inspiring fury upon the heads of giant boulders as far as 167 feet below.

In making their wild plunge, the angry torrents shoot with such might over the ledge that they land 49 or 50 feet forward of it, where they churn themselves into a boiling, seething, swirling cauldron. The fairy-like foam and spray rebound many feet, lading the air with silvery mist and sparkling in gorgeous rainbows under the sunlight. The ceaseless roar explains the name Niagara, meaning "Thunder of Waters," given by the Iroquois Indians.

In the center of the river Goat Island splits the cataract into two falls, the Canadian, on the left or west side, and the American on the right side. The former, called Horseshoe Fall because of its shape, measures about 3,000 feet along the curve and is 158 feet high. The American Fall, which is comparatively straight, measures 1,000 feet wide and 167 feet high. Its volume of water is only a little more than 5 per cent of the total flow; hence the Canadian fall is much the grander. The greatest depth of water at the crest of the American Fall is three and one-half feet as compared with 20 feet for the Canadian fall.

The falling water has worn the rocks away so that there are caves under the majestic curved sheets of both falls, from which sightseers, clad in waterproofs, obtain a magnificent view. The Canadian fall has excavated a plunge basin 192 feet deep, which temporarily retards the waters and enables a little tourist steamer to poke its nose right up into the mist. Scenic railway and trolley lines skirt the river.

In winter parts of the great falls are often frozen over; and icicles, far thicker and taller than the pillars in any cathedral, glisten like diamonds in the sunshine.

Scarcely less marvelous than the falls are the river rapids above and below them. The Niagara River, part of the boundary between New York and Ontario, is Lake Erie's outlet into Lake Ontario, 33 miles northward. The level of the latter lake is about 330 feet lower than that of Lake Erie, but for about 20 miles the river makes only a small portion of the descent. Then it narrows from about three miles in width to less than a mile, and in the remaining mile or so above the falls it descends 52 feet, gaining such rapidity as it dashes over its rocky bed that it forms the Upper Rapids, forever lilting, foaming, chopping, bounding.

The Great Rapids and the Whirlpool

Making about half its total descent at the falls, the river enters the picturesque Niagara Gorge—banked by perpendicular walls of rock 200 to 500 feet high—flows a couple of miles farther and then forms the famous Whirlpool Rapids, extending for about a mile and descending about 100 feet. Gnashing and booming their way over huge boulders at the rate of 30 miles an hour, these rapids are even more savage than those above the falls.

Just below these rapids, the river, making a sharp turn to the left, has worn into the rock a large circular basin. This is the Whirlpool, one of the greatest maelstroms in the world. Here the whirling eddies pursue one another around in circles, lashing the stream into foam and spume. The Whirlpool is viewed from cars

swung on an aerial cableway 1,800 feet long. The gorge near the falls is spanned by three bridges, two of them railroad bridges.

Nearly four miles farther on the gorge ends. Ages ago, possibly 35,000 years ago, this terminal slope used to be the cliff over which the fall descended, and there was no gorge. Since then the falls, by gradually eating and wearing away the rocky ledge or crest, have worked their way backward seven miles, digging the gorge as they receded. This is still going on, the edge of the American Fall retreating from two to seven inches a year, and Horseshoe Fall retreating from two to five feet a year because of its greater flow of water. During the past 50 years, the Horseshoe Fall has worn back about 200 feet. Occasionally, immense fragments have broken loose and have piled up in massive heaps below. One of the greatest breaks occurred in 1931, when a section of rock weighing 80,000 tons tumbled from the brink of the American Fall and left a tremendous U-shaped gash.

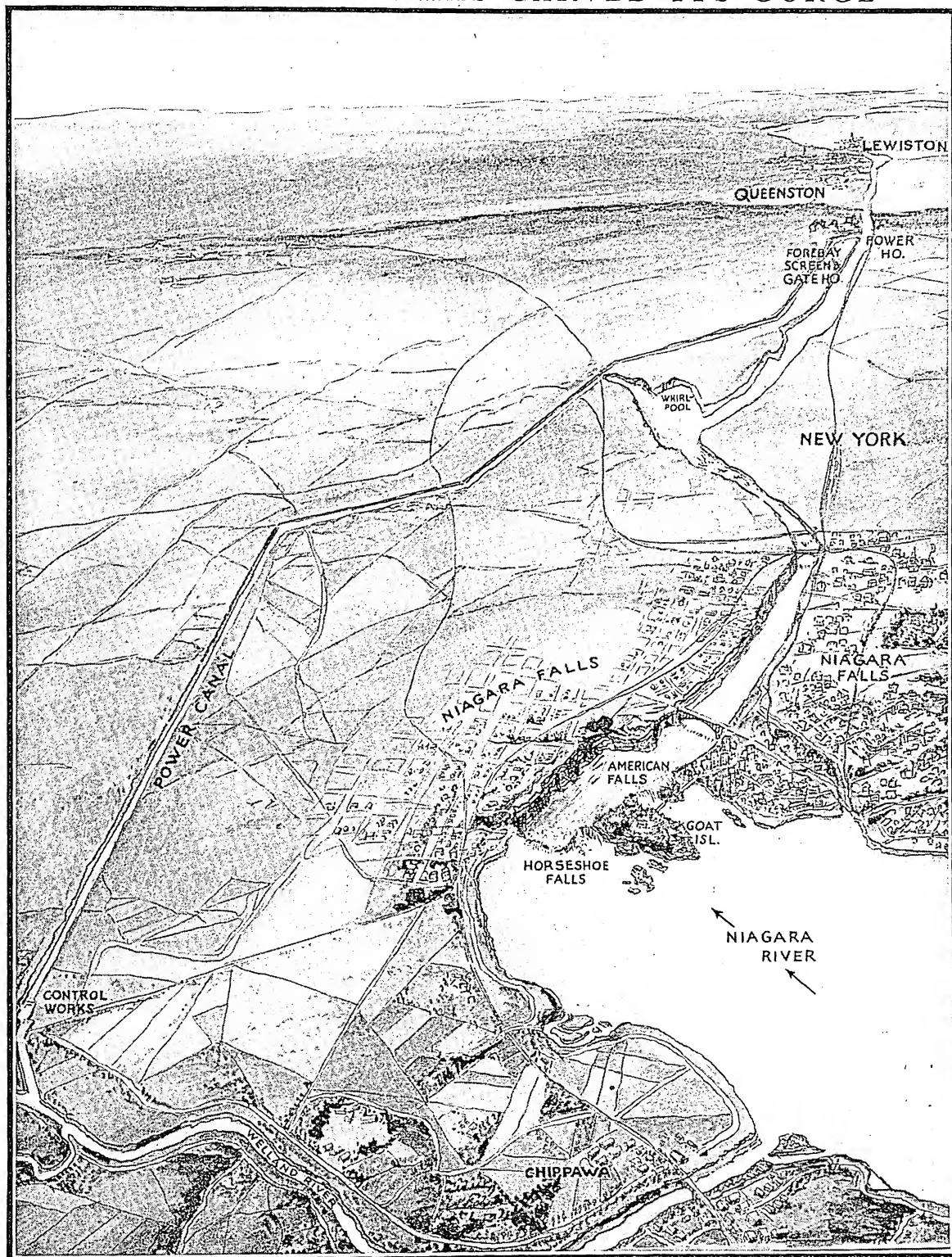
The fascination of Niagara has prompted many foolhardy exploits. Some adventurers have tried to swim the rapids or go over the falls in specially made barrels and rubber balls. Charles Blondin walked across the gorge on a tightrope, once blindfolded, once with a man on his back, and again on stilts.

Putting the Water Giant to Work

Fractional Niagara is more than a spectacle; it has been made into a benefactor of mankind. One glimpse at it suggests power; and power there is. Fed by the mighty reservoirs of the Great Lakes, it pours over its precipice a volume of water great enough to develop more than 3,975,000 horsepower—sufficient to keep the wheels turning in hundreds of industrial plants. If the full drop from lake to lake were used, about 6,000,000 horsepower could be obtained. At present well over a million horsepower is "harnessed." Water is drawn from above the falls into canals and conducted down to subterranean sluiceways and tunnels, where it flows through gigantic turbine wheels and thence back into the river below the falls. The wheels, spun around by the water at 100 or more revolutions a minute, are connected by upright shafts with humming dynamos in the long flat power houses along the river banks below the falls. Thus the dynamos generate electrical energy, some developing 70,000 horsepower. This energy not only serves important chemical and aluminum industries near by, but it also supplies light and power to towns and cities within a radius of more than 200 miles.

Although little was done toward the "harnessing of Niagara" until the invention of the dynamo and the transmission of energy by electric wire, the building of power houses and factories soon thereafter threatened to destroy the falls as a spectacle by the withdrawal of water above the brink. An appreciable difference in the volume of the cataract already had been made when in 1910 the governments of the United States and Canada made provision for restricting the water used for industrial purposes to

WHERE NIAGARA HAS CARVED ITS GORGE



Looking north you see here the 15 miles of the Niagara River's course between Chippawa and Lake Ontario. Notice the sharp downward break in the land near Queenston. It is this "Niagara Escarpment" that created the Falls, at the end of the Ice Age. Through the ages the river has been wearing down its bed and carving out a gorge, until the Falls are now about seven miles

nearer Lake Erie than they were originally. Geologists have tried to estimate how long this process has taken and thus get a "geological clock" to measure the time since the retreat of the ice sheet. The United States and Canada divert much of the natural flow to generate electric power. The Canadian canal at the left carries water to a powerhouse near Queenston.

20,000 cubic feet a second on the American side, and 36,000 cubic feet a second on the Canadian side.

From early times, Niagara has been one of North America's greatest tourist attractions. The number of visitors is said to average between one and two millions a year. Beautifully landscaped parks on both sides add to the beauty of the scene, and at night the falls are illuminated by colored lights.

Two Cities of the Same Name

The city of Niagara Falls, N.Y., on the United States side, is a great center of chemical and metallurgical industries which get their power from the falls. Development of hydroelectric power here dates back to 1881, when current for a few arc lights was generated by Niagara's power. Enormous quantities of aluminum, calcium, carbide, and graphite are now produced. Other major products include abrasives, paper, breakfast cereals, flour, and machinery. On the western side is Niagara Falls, Ontario, where several United States companies have their Canadian plants. Population of Niagara Falls, N.Y., 78,029; of Niagara Falls, Ontario, 19,046. (See also Welland Ship Canal.)

NIBELUNGS (*ne'be-lungs*), SONG OF THE. In the Middle Ages the minstrels of northern Europe roamed from castle to castle entertaining the people with song and story. One of their favorite themes was the long series of heroic deeds and tragic events centering around the treasure of the Nibelungs, a mythical race of Scandinavian dwarfs. These tales at last took written form in German as the *Nibelungenlied*, or Song of the Nibelungs, and in a Scandinavian version known as the *Volsunga Saga*. From them Wagner took the stories of his Ring cycle of operas (see Opera; Wagner, Richard).

The story of the evil treasure begins, in the older version, when three gods, Odin, Loki, and Hoenir, saw an otter devouring a salmon. They killed the otter and bearing the pelt with them sought shelter for the night in the abode of Rodmar, a greedy heartless miser. Rodmar recognized the pelt as being that of one of his sons, who had the power of changing his shape. He demanded as pay (*wergeld*) for the slaying of his son enough gold to completely cover the otter pelt. To get the gold the gods hastened to the river and seized a priceless treasure which was guarded by a giant fish, but when all was heaped upon the pelt one hair remained uncovered. Yielding to Rodmar's demand, Loki placed on this a ring which bore this curse: "Evil shall come to him who wears it." This treasure passed after a time into the hands of the Nibelung kings, and played its tragic part in the '*Nibelungenlied*'.

In the Song of the Nibelungs this hoard is found in the possession of Siegfried, a daring warrior, who has slain the two kings of the Nibelungs to obtain it. Little mention is made of the curse, and the story deals chiefly with the adventures and loves of humans, the gods having altogether disappeared from the scene. The plot centers around Kriemhild, the beautiful sister of Gunther, king of the Burgundians, who holds his court at Worms, on the middle Rhine. Siegfried comes to Worms to woo Kriemhild, and in due course they are wedded.

Many characters are introduced into the story, one being Brunhild, an Icelandic princess of wonderful beauty and warlike strength. Only he who should overcome her in deeds of skill and strength might win her love and hand. King Gunther, attracted by the fame of her beauty, goes to woo her, and Siegfried accompanies him as his friend and ally. Wearing a cloak of darkness which makes him invisible, Siegfried aids Gunther in defeating Brunhild in three tests of prowess—hurling for him the spear, putting the weight, and jumping with Gunther in his arms far beyond the limit that Brunhild could reach. So Gunther weds Brunhild, and she comes to dwell in the court at Worms. Later on she learns of the deception that has been practiced upon her, and that Siegfried and not Gunther was the warrior worthy of her hand. Not long after, Siegfried is treacherously slain by one of Gunther's followers; and Brunhild slays herself with his sword. Kriemhild vows vengeance on her brother, for she knows that he is really responsible for her lord Siegfried's death. She marries Etzel (Attila), king of the Huns, and after many years invites Gunther to visit the kingdom. He comes bringing his followers, but is met by a powerful army and overcome. Gunther is put to death and Siegfried is thus avenged.

The treasure again enters the story at this point, Kriemhild demanding from Hagen, a vassal of Gunther and the slayer of Siegfried, the hiding place of the hoard. He refuses to impart it, saying—

None knoweth of the treasure save God and me alone:
And unto thee, she-devil, it never shall be known.

Enraged, Kriemhild grasps Siegfried's sword and decapitates Hagen, but is herself slain by a follower of Etzel.

The story is thus filled with tragedy. This perhaps is due to that element in the story which was known to the older versions but forgotten in the later—the curse of the Nibelung hoard which falls upon all who possess it.

NICARAGUA. The largest of the Central American republics and the most beautiful, Nicaragua stretches across the isthmus from the Caribbean to the Pacific coast. In colonial times its cities were known as "the first jewels of the Spanish crown," and its fertile lake plains described as an earthly Paradise. Yet, with wonderful mineral and forest resources and a marvelously fertile soil, it is still one of the least developed countries of Central America. Although it lies in one of the most celebrated and dangerous volcanic regions of the earth, man has done more to retard its progress than has nature. The eruptions of lava have created a marvelously fertile soil; but the civil strife of more than a century that followed the country's declaration of independence in 1821 has laid waste the cultivated plains time after time, decimated the cattle that once roamed the hill ranches in herds of thousands, and caused a labor shortage that makes even ordinary progress impossible. Nicaragua is one of Latin America's most turbulent countries.

As in most countries of Central America, the majority of the people live along the volcanic Pacific slope. The principal port is Corinto, in the north, from which nearly two-thirds of the country's shipping is done. Leon, about 25 miles southeast, has perhaps the finest public buildings in Central America. Managua, the capital, lies near the foot of a mile-high pyramidal cone, Momotombo, on the south shore of Lake Managua, which is surrounded by volcanoes. Managua was destroyed by earthquake and fire on March 31, 1931, when more than 1,000 were killed and 45,000 left homeless. Granada stands on beautiful Lake Nicaragua, which is also skirted by giant volcanoes with coffee plantations climbing their sides. A railroad connects these cities with Corinto. Lake Nicaragua, 110 miles long and more than 3,000 square miles in area, is the largest Central American lake. Connected with it is Lake Managua, 38 miles long.

The plan for a United States canal across Nicaragua, abandoned when the Panama Canal was built, is again under consideration. United States Army engineers have surveyed and approved a proposed route. In 1916, the United States paid \$3,000,000 for the exclusive right to build the canal, and acquired naval bases in the Bay of Fonseca on the Pacific coast, and on Big and Little Corn Islands on the Atlantic coast.

On the uplands near the Pacific the climate is mild, but elsewhere it is distinctly tropical, with a mean temperature of 80 degrees. There are but two seasons, the wet and the dry.

A Trip through the Country

On the slopes of the mountains and volcanoes and in the high plateaus are the great coffee plantations, where the principal crop of the country is raised. Much land is still uncultivated because of the scarcity of labor, but here and there in the fertile lake regions are fields of tall sugar cane waving in the breezes, cacao farms, and acres of tobacco, corn, rice, and beans, which are grown for local use.

The hot lowlands east of the mountains are practically uninhabited, but the Atlantic shore, in spite of unhealthful swamps and tropical forests, is of great commercial importance. Two hundred thousand acres are employed for the cultivation of bananas.

Coffee and bananas are the chief exports. Coffee is shipped from Corinto and bananas from Bluefields, the main Atlantic port. Other exports are gold, silver, cabinet woods, hides, cacao, and cotton.

Bitter rivalry between Conservatives and Liberals has frequently resulted in armed conflict. To protect its political and commercial interests and prevent foreign intervention, the United States stationed marines in the country almost continuously from 1912 to 1933. The marines actively intervened on several occasions to assure the continuance of a government friendly to the United States.

Nicaragua has about 850,000 inhabitants, and an area of 49,200 square miles. The western half contains three-fourths of the population, chiefly of mixed Spanish and Indian blood. (See also Central America.)

NICE (*nēs*), FRANCE. Tucked in between the mountains and the sea, at the north of the gulf of Genoa, is the veritable little fairyland known as the Riviera. Behind it rise the Maritime Alps in sharp sea-crags and great rocks like ruined towers, protecting it from the harsh north winds. To the southward stretch the shimmering blue waters of the Mediterranean. And between, in a great crescent, lie the flower-decked foothills and the shining shores from which come so many fruits, perfumes, and flowers. Trees grow here which are not usually found so far north—date-palms and bananas, pepper trees, and the eucalyptus and the prickly pear. Olive groves alternate with acres of roses, violets, and hyacinths. And here thousands of tired or ill people have been made well again, and here the poet Shelley wrote, and died, and was burned in a magnificent funeral pyre at night on the Bay of Spezia.

At the extreme western end of the Riviera, in the small part that belongs to France—for most of it is in Italy—is the famous pleasure city of Nice. Here people go by the thousand every year to bask in the sun, to throw flowers and confetti at one another in the famous carnival, to watch the fireworks in the Villa des Fleurs, and to play in the Casino. Here visitors from the harsher northern climates find health, and perhaps happiness.

The town itself is divided into three parts—the New Town, the Old Town, and the Port. Nice has a cathedral, a museum, an observatory, and a library. Its main export is olive oil. Besides oil-works it has perfumery factories, soap works, tanneries, and furniture factories.

Nice was first settled over 2,000 years ago by Greek colonists of Marseilles, and received its name (Latin *Nicaea*, from Greek *Nike*, "victory") from a victory over the neighboring tribes. It became subject to Rome in the 2d century B.C. and since then has suffered in many wars and at the hands of many races. It was once in the hands of the Saracens; once the Turks pillaged it; it has belonged to Provence and Savoy, and was a part of the kingdom of Sardinia-Piedmont. In 1860 it was ceded to France as the price of aid rendered in creating the present kingdom of Italy. Its most famous son was Garibaldi, the knight-errant of Italian unity. Nice, like all the Riviera, has at times severe earthquakes. In the last century it suffered four times, the most severe being in 1887. Population, about 245,000.

NICHOLAS, CZARS OF RUSSIA. An attempted liberal revolution (the "Decembrist" uprising) at the time he succeeded his brother Alexander I, helped to make NICHOLAS I (1825-1855) a thoroughgoing reactionary. An iron despotism and an elaborate spy system gripped Russia in his reign; and though he warred against Turkey in 1828-29 to enable the Greeks to win their independence, he used his armies to crush the Hungarian uprising against Austria in 1849. The chief event of his reign was the Crimean War (1854-56) which he began with a view to secur-

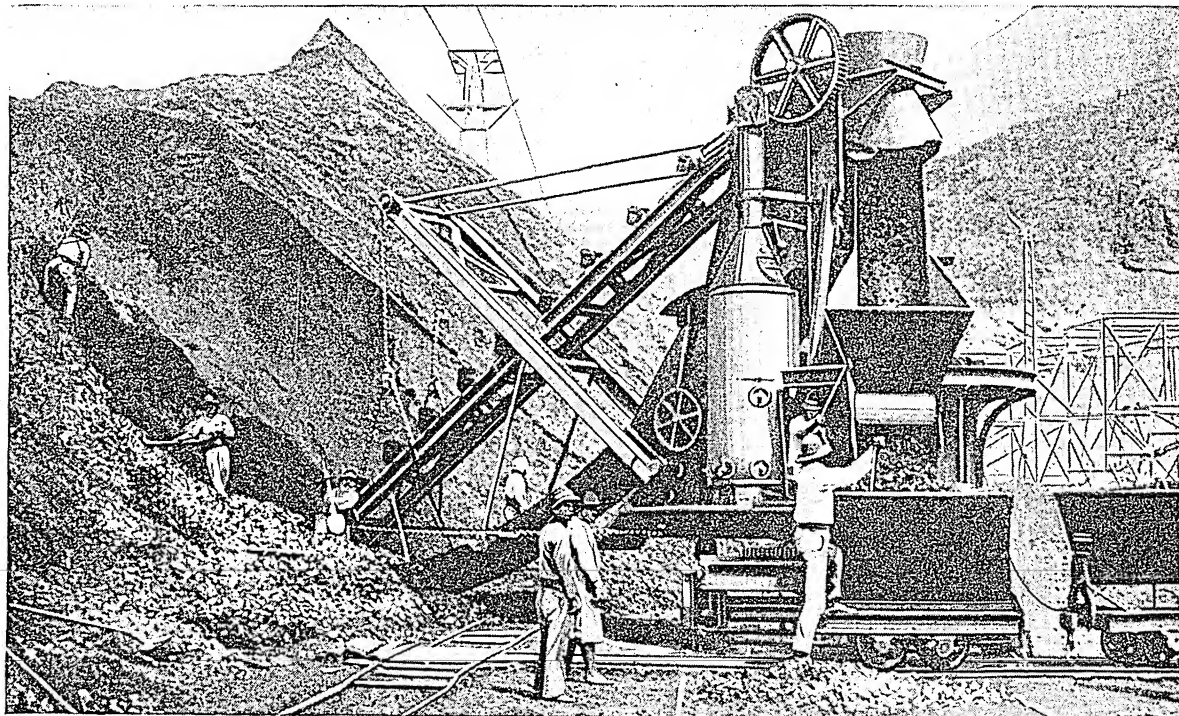
ing Constantinople and the lion's share of the inheritance of the "Sick Man of Europe." Chagrin at the failure of these plans, through the aid given Turkey by Great Britain, France, and Piedmont, was probably a factor in his death, at the age of 59 years.

NICHOLAS II, the last of the czars (1894-1917), was the great-grandson of Nicholas I and succeeded his father Alexander III on Oct. 24, 1894. He was a weak but well-meaning ruler, influenced largely by his wife (a German princess), who was under the influence of the reactionary element at the Russian court. A base but clever monk named Rasputin gained great influence by appealing to the superstitious fears of the czar and czarina. The first Hague Conference, called by the czar in 1899 to consider disarmament, showed a sincere desire to remedy the evils of militarism; but the disastrous Russo-Japanese War (1904-05) showed equally that the corrupt military element still controlled Russia. Widespread revolutionary movements which followed that war forced the czar to call the Duma (legislative assembly) which was expected to end autocracy and introduce constitutional government; but the "dark forces" were still too strong and by successive interferences with the Duma and the electoral law it was robbed of all power. When war threatened in 1914 Nicholas II was torn between his desire to protect Serbia against Austria and his fear of a general European war; he was hectored on one side by William II of Germany, and tricked by his own militarists.

When the war came, the criminal corruption, negligence, and lack of ability of the czar's officials brought severe defeat to Russia in the first two years. The inefficiency of the ministry, the failure to coöperate with the Duma, the suspicion that the court party meditated a separate peace with Germany, the forfeiture of public respect through the known influence of the monk Rasputin over the neurotic czarina and the feeble czar made a revolution inevitable. The storm broke in March 1917, and Nicholas was forced to abdicate the Russian throne. Immediately he became virtually a prisoner, and he and his family (the czarina and their four daughters and one son) were carried to Ekaterinburg in the Ural Mountains. There they lived until the Bolsheviks overturned the Russian government. On July 17, 1918, the czar and his entire family were brutally murdered by orders of the local soviet (*see* Russia).

NICKEL. This metal got its name from a German word for imp, because of the trouble it gave chemists in early times. But today it is one of our most useful metals. It is silvery, lustrous, hard, malleable, and magnetic. Pure nickel is seen only in coatings (nickel plate) on other metals, where it is used to embellish them, to protect them from rust or tarnish, or to give them a better wearing surface, as in the case of quality printing plates. The coat is applied by electroplating (*see* Electroplating). Alloyed with copper, nickel is widely used in coins. Alloyed with three parts of copper and one of zinc, nickel forms a

WHERE NICKEL STARTS ON ITS TRAVELS



For all you know, the 5-cent piece you have in your pocket began life in this island of New Caledonia in the far-away Pacific, for this island contains important deposits of nickel ore. You see how the machine scoops out the ore from the bank and loads it into waiting cars.

bright silvery metal known as "German silver" or "nickel silver," largely used for making tableware and as a base for silver-plated ware.

These uses, however, are comparatively unimportant. The greater part of the annual supply goes into the manufacture of nickel steel, an alloy especially adapted to withstand repeated strains. It is used in armor plate, cannon, structural work, bridges, railroad rails at curves, rivets, locomotive boilers, engine forgings, automobile gears, shafts, and axles, trailer frames, and dipper teeth of steam shovels.

A special nickel steel called "invar," containing 36 per cent nickel, is used for measuring implements and pendulums, because it is practically non-expansive within ordinary temperature variations. Another nickel steel called "platinite" expands at almost the same rate as glass, and so is used for the connecting wires in electric light bulbs.

Nickel forms many other alloys, which serve a wide variety of purposes. Copper-nickel alloys are used for bullet jackets and boiler tubes. Nickel-chromium steel is used for automobile forgings and gears, and for armor-plate. Electrical-resistance wire in electric appliances is usually an alloy of nickel with other metals—iron, chromium, or copper.

Monel metal is a "natural" alloy of nickel and copper, made by reducing certain ores which contain both these metals. This tough, lustrous, corrosion-resisting alloy is used for food-handling equipment, valves, turbine blades, propellers, wire filter cloth, and many other purposes. (See Alloys.)

Nickel oxide is used in Edison storage batteries, in glass-making, and in pottery glazes. The salts are employed in electroplating and in hardening oils for making soap and oleomargarine. Nickel resists the action of most acids except nitric acid.

Most of the world's nickel comes from the Sudbury district of Ontario, where the principal ore is pentlandite, an iron-nickel sulphide. New Caledonia is the only other important producer.

NICKNAMES. "Nicknames and whippings," said Walter Savage Landor, "when they are once laid on, no one has discovered how to take off." Nations, like persons, have nicknames which grow up in curious ways and become fixed. The nickname "Uncle Sam," applied to the United States, is known the world over. This is the way it originated. During the War of 1812 someone inquired as to the meaning of the letters "U. S." stamped on government goods. He was told that they stood for "Uncle Sam," the local title for Samuel Wilson, the government inspector. This jest was repeated throughout the country; the name stuck, and "Uncle Sam" came to personify the United States government and the American people.

This nickname became even more popular than the earlier one, "Brother Jonathan." The original of the name "Brother Jonathan," according to the story, was Washington's friend, Gov. Jonathan Trumbull of Connecticut. When perplexed by the

need of arms and war material, General Washington would say, "We must consult Brother Jonathan." This expression, being often repeated, came into common use and at last was extended to the American nation as a whole.

Brother Jonathan, like Uncle Sam, is always portrayed as a tall thin man with long narrow beard, long-tailed coat, high hat, and a shrewd but humorous, countenance—attributes which marked the typical American of the early days.

Very different is "John Bull," the personification of the English nation, who is represented as a stout, ruddy-faced, matter-of-fact, blunt fellow attired in leather breeches and top-boots, generally with a cudgel in his hand and a bulldog at his heels. The name "John Bull" was first used in a political satire published by Dr. Arbuthnot at the time of the War of the Spanish Succession, in Queen Anne's reign.

There are many nicknames, generally of an complimentary character, applied by the people of one nation to those of another. Thus the American called the Mexican a "Greaser," referring to his untidy appearance; while to the Mexican or Spanish-American an American or Englishman is a "Gringo" (from the Spanish word for gibberish or unintelligible speech). (See also Yankee.)

Some people have thought that the word nickname came from "nick," to cut, since a nickname is often a shortened form of the full name; but the word was originally "eke name" and meant an added name.

NIGER (nī'gēr) RIVER. To see the soul of tropical Africa, there is nothing better, perhaps, than a voyage down the great Niger River, next to the Congo and the Nile the largest stream in the Dark Continent. Its course of 2,600 miles leads through mountainous uplands, traverses broad flat prairies, skirts the vast sandy wastes of the Sahara Desert, plunges through giant forests, and feels its way to the ocean through a score of mouths, bordered with mangrove swamps.

Rising only 150 miles from the sea in French Guinea, above Sierra Leone, it sweeps first northeastward, then southeastward, then straight south into the Gulf of Guinea, forming a great arc which incloses one of the richest and most picturesque of African empires—a region chiefly divided between France and Great Britain.

As a navigable stream, the Niger is of immense importance. Steamers of light draft can make their way over most of its length, and through its largest tributary, the Benue, it provides a highway for 900 miles eastward into Central Africa. A railway connects the upper reaches of the Niger with the Senegal River emptying on the extreme west coast. Thus by boat and rail travelers can reach the famous markets of Sansandig, Segu, Timbuktu, and other river stations far in the interior toward the desert. The Niger shipping is chiefly engaged in transporting the palm oil, nuts, copal (a resin used for varnishes), tree gums, rubber, coffee, ivory, and other products of this vast and luxuriant river basin.

The Niger delta is one of the most remarkable in the world, consisting from 40 to 70 miles from the seacoast of a great network of interlacing creeks and broader channels in which mingle the waters of small independent streams until it is impossible to trace the main river. The chief entrances for large ships are the Nun Mouth, the Forcados, the Brass Mouth, and the Bonny. The climate of the delta is one of the most unhealthful in Africa, but the British who control this portion of the Niger valley are slowly stamping out disease spread by mosquitoes and the dreaded tsetse fly.

Though the Niger River was known by reputation to the ancients, its course was not accurately mapped until late in the 19th century because of the obstacles placed in the way of explorers by the fierce tribes of black cannibals dwelling along its banks. (See also Africa.)

NIGHTHAWK. The "high-dive" is this bird's specialty. With wings almost folded, he will plunge downward from a height of several hundred feet until within a few feet of a housetop or of the ground; then with a sudden spreading of his wings he checks his

A LIVING INSECT TRAP



While the Nighthawk spends its days quietly crouching in some tree or cranny, by night it swoops through the air with its huge mouth wide open, trapping scores of hapless insects.

dizzy descent and swoops upward, to repeat the thrilling exhibition over and over. No satisfactory explanation for this trick has been found. Some observers believe the nighthawk is pouncing upon an insect, but if this is the case his power of sight must be almost beyond comprehension, and why would he repeat the dive again and again?

This bird has a great froglike mouth that opens from ear to ear. During flight, it is held wide agape and like a trap catches in vast numbers the winged insects on which the bird feeds. The stomach of one bird was found to contain the remains of 1,800 flying ants, and another the remains of 34 June-bugs. Curiously enough, the beak that goes with this great mouth consists merely of a tiny tip, less than a half-inch in length.

The nighthawk belongs to the same family as the whippoorwill. To speak of it as a "hawk" is most

misleading, for the bird has neither the disposition nor the appearance of a hawk. The nickname "goat-sucker" and "bull-bat" are no more apt, but the term "night-jar," often applied to it, might describe the effect either of the booming sounds made by the rush of air through the taut feathers of the wings during its spectacular dive, or of the sharp "pee-ent!" it utters as it circles through the dusk of evening.

The large wings of the nighthawks are quite out of proportion to their robin-sized bodies. The plumage is a mixture of black, gray, brown, and buff, almost invisible against the bark of a tree. When in flight a patch of white is conspicuous on each wing, distinguishing them from their relatives, the whippoorwills. Their legs are small and weak, so they sleep sitting lengthwise on limbs instead of sidewise as most birds do. (For illustration in color, see Birds.)

Nighthawks nest in gravelly places—in open fields or on large flat rocks; sometimes on gravel roofs in cities. They lay two grayish-white eggs, spotted with black. They breed throughout North America from the southern parts of the Yukon territory, Quebec, and Newfoundland down to southern California, Arizona, and the northern Gulf states, and in their winter migrations they fly as far as southern South America.

Nighthawks belong to the goatsucker family of the order *Caprimulgiformes*. Scientific name, *Chordeiles minor*.

NIGHTINGALE. No bird has been more celebrated in literature than the nightingale, which is the poet's own bird. Homer wrote of the "sweet, tawny nightingale"; Milton called it the "most sweet, most melancholy bird," and Keats is writing of the nightingale when he writes of the

... song that found a path
Through the sad heart of Ruth, when, sick for home,
She stood in tears amid the alien corn;
The same that oftentimes hath
Charm'd magic casements, opening on the foam
Of perilous seas, in faery lands forlorn.

Americans have to go abroad to hear this most famous of birds, for it does not occur on the west of the Atlantic. The hermit thrush and mocking bird are the only American birds that approach the nightingale in beauty of song. It is found throughout Europe, most abundantly in southern France, Spain, and Portugal, and in parts of England. Its song is heard most often in the spring, for a few weeks after its return from the South. The Persian *bulbul*, and another species of night-singing bird found in Asia, are probably the nightingales of the Persian poets and the Greeks and Romans.

THE NIGHTINGALE



The male (above) and the female (below) are almost identical in size and coloring. It is the male whose song is so celebrated.

During the mating and nesting season, from the middle of April to the middle of June, the male, perching near his tiny house, sings both day and night. His song is a melodious outpouring of glorious tone and is evidently an expression of devotion to his mate, for although the bird endures cage life, the male sickens and dies if taken during this time of the year.

The sober appearance of the nightingale is in striking contrast to the richness of his song. The bird is about six inches long, with rusty brown and gray plumage, and is shy and quiet in its habits, frequenting shrubs and low trees.

The nightingale belongs to the family of Warblers, or *Silviidae*. The common European nightingale is the *Daulias luscini*. A larger eastern species is *Daulias philomela*. The famous *bulbul* of the Persian poets is *Daulias hafizi*.

NIGHTINGALE, FLORENCE (1820-1910). This Englishwoman, the first and greatest of woman war-nurses, who revolutionized the methods of caring for sick and wounded soldiers, was born in the city of Florence, Italy; but she grew up on her father's country estate in Derbyshire, England. There, while still a child, she helped a doctor set and bandage a collie dog's broken leg, and nursed the grateful animal back to health. At 18 she was taken to London and presented to the young queen Victoria.

As a debutante in court circles she could have had a gay season and perhaps made a brilliant marriage. But caring nothing for society, she spent her time in studying the work of the great hospitals. In a year or so she left her beautiful home and friends to take the hard training of a nurse in convent hospitals on the Rhine and in Paris. At that time it was an unheard-of thing for a gentlewoman to become a professional nurse.

Returning to England Miss Nightingale attracted attention at once by reorganizing the sanitarium of the London Institution. She was 34 years old, and widely known in the medical world, when the Crimean War broke out, and a British army was sent overseas to help Turkey against Russia. When reports came of the terrible sufferings and high death rate of the sick and wounded English soldiers and sailors, she offered her services to the government. Within a week she enlisted 37 nurses, filled a ship with supplies, and steamed to Scutari, where she arrived in time to receive the wounded from the famous battle of Balaklava.

The story of Miss Nightingale's heroic labors in hot and fetid camps, and in barracks which served for hospitals, is one of the brightest chapters in British military annals. England's bravest and best were dying like flies when she took charge. She soon reduced crowding, confusion, dirt, and neglect to space, order, cleanliness, and prompt attention. The death rate fell from 40 to 2 per cent. When stricken with fever herself, she refused to leave her post. No matter how long and hard had been a day's work, she always made the night rounds of the wards, lamp in

hand, to see that the attendants were on duty, and to speak cheering words to her charges. Ever afterwards she was known with grateful affection as "The Lady with the Lamp." One of the many tributes paid to her at the time was Longfellow's poem 'Santa Filomela'.

When the war was over, a British naval vessel was dispatched to fetch Miss Nightingale home. But taking a French steamer she slipped into England unnoticed. The fund of 50,000 pounds sterling (\$250,000) that was raised for her by popular subscription she used to found the Nightingale Home for Convalescents.

Her health had been so undermined by her war work that, although she lived to the age of 90, she was always an invalid. Nevertheless her life continued to be one of the widest usefulness. She wrote standard books on nursing and advised many countries on the building and managing of public, private, and military hospitals. No one else did so much as she to raise the profession of nursing to the high place which it holds today.

NIGHTSHADE. Bobbing up here and there in the waste places of various parts of the world is a weed, related to the potato, whose slender erect 12-inch stem, pointed oval leaves, drooping clusters of white flowers, and small rather round berries are often regarded with suspicion. However, it is only when animals chew the fresh leaves of this common or black nightshade, or when people eat too many of its berries, that injury results. The leaves are boiled in some warm climates and eaten as a sort of greens.

Another plant of this nightshade group is the blue-blossomed bittersweet whose somewhat poisonous scarlet berries taste both bitter and sweet. Still another kind that is not very harmful is the horse nettle or apple of Sodom with its orange berry, which is a native of western North America. Many of the different nightshade plants contain an element that will slightly deaden pain. It is, however, a plant of an allied genus found in various parts of Europe and Asia, whose leaves and roots are particularly used in medicine. This is the deadly nightshade or belladonna, a disagreeable-smelling five-foot shrub with dull green leaves, purple bell-shaped flowers, and black cherrylike fruit. Because it can dilate the pupil of the eye, atropine, obtained from this plant, is especially used by oculists.

There are many species of the typical genus *Solanum*, of the nightshade family (*Solanaceae*). Scientific name of common nightshade, *Solanum nigrum*; of bittersweet, *Solanum dulcamara*; of deadly nightshade, *Atropa belladonna*.

NILE RIVER. For thousands of years there has been a question as to where the Nile, the longest river of Africa and after the Missouri-Mississippi the longest river in the world, may be said to begin. In one sense it begins at Khartum. Here the Blue Nile, flowing clear and blue from the Abyssinian mountains or reddish-brown in flood time, meets the grayish-green White Nile which comes from the lake

region of Central Africa. The sources of the Blue Nile were known in ancient times, but of the White Nile the geographers told legends of the Mountains of the Moon and of underground channels. It is only in recent times that explorers have followed it back through the swampy "sudd" region with its reeds, white, blue, and crimson water-lilies and other floating vegetation, and its mosquitoes, past the rapids and waterfalls in which it descends from Lake Albert like a gigantic mill-race, and from Lake Albert through the beautiful gorges of the Victoria or Somerset Nile which feeds Lake Albert from Lake Victoria, and thence to the headwaters of this lake, the Kagera River.

From Khartum to Assuan the Nile descends in six cataracts. After Khartum it receives only one tributary, the Atbara, another Ethiopian stream, which is 600 yards wide in flood time, and between whiles almost dries up, so that fish, turtles, crocodiles, and hippopotami remain imprisoned in the deep pools of its upper reaches until the next flood time. After watering the whole land of Egypt the Nile finally reaches the Mediterranean through two channels. These are called the Rosetta and the Damietta mouths and the general region is known as the Delta. Having received no new tributaries and having lost much through seepage and evaporation, the Nile ends as a smaller stream than it was higher up. In summer it does not really reach the sea at all.

The yearly flood of the Nile has for centuries been the secret of Egypt's fertility. The heavy April rains in the basin of the White Nile start the first flood and the May rains in Ethiopia give the real flood of rich muddy water that fertilizes as well as irrigates. The great dam at Assuan stores up the surplus flood and releases it later on, so that the Nile valley may be watered all the year around. The length of the Nile from Lake Victoria to the Mediterranean is about 4,000 miles. The Blue Nile is about 840 miles long. (See Egypt.)

NINEVEH (*nīn'ē-vē*). When the people of Israel were groaning under the heavy yoke of the proud and ruthless Assyrian kings, the Old Testament prophets called down the vengeance of heaven on Nineveh, the splendid capital of the Assyrian Empire. "Woe to the bloody city!" they cried. "The Lord will make Nineveh a desolation and dry like a wilderness." The prophecy was fulfilled when the hordes of the conquering Medes and Chaldeans more than 25 centuries ago (606 B.C.) swept over the doomed city and made it a desolate waste. As the centuries went on the sun-dried bricks of which most of the houses were built crumbled to dust, and the drifting sands covered the ruins, mounting higher and higher, until every trace of the once mighty capital was lost and the very memory of its location had disappeared except for a native tradition.

It was not until the middle of the 19th century that scholars set to work on the vast flat-topped mounds with pick and shovel, and uncovered evidence that

they did indeed mark the site of one of the most magnificent capitals of antiquity. More than that, the walls and sculptures and libraries they brought to light have enabled men of science to rewrite the great lost chapters of history that tell of the empire of the Assyrians. Nearly every important fact we have today about Assyria has been discovered since our grandfathers went to school, as the result of the excavations at Nineveh and other sites in the ancient valley of the Tigris.

One of the earliest and most successful of these investigators was an Englishman, Sir Austen Layard, who unearthed (1845-51) the great palaces of Sennacherib and Ashurbanipal with their alabaster bas-reliefs of hunts and sieges and battles, and colossal winged man-headed statues of bulls and lions. Most important of all, he found many thousand tablets of Ashurbanipal's library, which have now been deciphered and tell us the story of science, history, religion, and literature in the days of Assyria, and Babylonia as well. Excavations have been proceeding ever since, but incalculable treasures still remain to be brought to light.

The mounds, extending at intervals for some 15 miles along the Tigris, opposite the modern city of Mosul, represent not only the city of Nineveh proper, but also of Dur-Sargon, the city of Sargon II, and Kalah. Nineveh, though it existed at least as early as 2000 B.C., was chiefly the creation of Sennacherib (705-681 B.C.), who walled and fortified it for two and a half miles along the Tigris, building a great new palace, and laying out extensive gardens. (See also Babylonia and Assyria.)

NIOBE (*nī'ō-bē*). One of the saddest stories in Greek mythology is that which tells how the proud Niobe, daughter of Tantalus and wife of Amphion, king of Thebes, was punished for her presumption. She boasted of her seven sons and seven daughters and despised the goddess Leto (Latona) who had only one son and one daughter. But the children of Leto were the great Apollo, god of the sun, and Artemis (Diana), goddess of the moon, and for this arrogance they slew all the children of Niobe with their arrows. Niobe's grief was so great that Zeus out of pity changed her into a rock on Mount Sipylus, from which tears continued to flow.

NITRIC ACID. For hundreds of years nitric acid has been one of the world's most important chemicals. Geber, the famous Arabian scientist, discovered it in the 8th century. He called it *aqua fortis* ("strong water") because it attacks so many other substances, including nearly all the common metals. It was first prepared by treating saltpeter (potassium nitrate) with oil of vitriol (sulphuric acid), and some is still made in that way.

Most of our supply, however, is derived from the oxidation of ammonia by the Ostwald method. Ammonia, prepared by the Haber process (see Nitrogen), is mixed with heated air and passed through platinum gauze, which acts as a catalyst. The ammonia (NH_3)

reacts with the oxygen in the air to form nitric oxide (NO) and water (H₂O). The nitric oxide is then further oxidized to nitrogen peroxide (NO₂), which unites with the water to form nitric acid (HNO₃).

Nitric acid is a colorless, fuming liquid with so strong an affinity for water that it is difficult to get a concentration over 95 per cent. The commercial acid ranges in strength from 50 to 70 per cent, and usually looks yellow from the presence of various oxides in

solution. For, in addition to being a strong acid, nitric acid is a powerful oxidizing agent.

When metals, metallic oxides, or carbonates come into contact with nitric acid, the salts called *nitrates* are formed. These are important in the making of fertilizers and explosives (see Fertilizers). The nitrating of cellulose for making rayon, pyroxylin, and similar plastics is accomplished with nitric acid (see Cellulose).

NITROGEN, PRESERVER and DESTROYER of LIFE

NITROGEN. About four-fifths of the air we breathe consists of the gas called nitrogen. But we don't use this gas in our lungs. We breathe it out again unchanged. It serves only to dilute the oxygen of the air so that we won't get too much at one time. This is one of nitrogen's most important jobs. If the air were all oxygen, breathing it would soon "burn" us up in the chemical sense of the word (see Oxygen). And if a blaze started anywhere, it would be virtually impossible to put it out. In pure oxygen, even iron will catch fire. As it is, the nitrogen in the air slows down the action of the oxygen.

Free nitrogen has this effect because it is very inactive. It does not burn or help other things to burn. It is slow to enter into any kind of chemical union. That is why there is so much of it at large in the atmosphere. It is not one of the commonest elements (see Chemistry), but what there is in the world is mostly out in the open. Relatively little nitrogen is locked up in combinations with other elements, compared, for example, to the vast amounts of oxygen and hydrogen locked up in the form of water.

Nitrogen Compounds Essential to Life

In sharp opposition to nitrogen's inactivity and its reluctance to form compounds stands the fact that *nitrogen compounds are absolutely essential to all forms of life*. Protoplasm, the complex substance inside all living cells, requires nitrogen for its formation; and the essential food materials called proteins are all built around nitrogen compounds (see Proteins; Protoplasm).

It is easy to see, therefore, that the processes by which nitrogen is captured and put to work are tremendously interesting and important to us.

Capturing nitrogen from the air is called *nitrogen fixation*. In nature it takes place in two ways: by the action of lightning and by the action of bacteria. When a flash of lightning passes through the air it causes nitrogen to unite with oxygen in the form of nitric oxide (NO). As this cools, it takes on another atom of oxygen and becomes nitrogen peroxide (NO₂). This in turn joins with rain water or water vapor (H₂O) in the atmosphere to form nitric acid (HNO₃). The acid is carried down to earth, where it reacts with minerals in the soil to produce nitrates, like potassium nitrate or saltpeter (KNO₃) (see Saltpeter). These nitrates can be used directly by plants to form the proteins out of which their living cells are built.

But the thundering and gigantic power of lightning is not nearly so effective as the quiet work of the tiny nitrogen-fixing bacteria. It has been estimated that electric storms produce all over the earth about 80 million tons of nitric acid a year. This is nowhere near enough to keep the supply of fixed nitrogen up to the requirements of living nature. Bacteria must provide the rest.

Bacteria That Put Nitrogen to Work

There are two kinds of nitrogen-fixing bacteria: those that live free in the soil and those that live on the roots of plants. The root-dwellers belong to the genus *Rhizobium*. The free-living kind include the species called *Clostridium pasteurianum* and several species of the genus *Azotobacter*. The former stands out like a saint among sinners, for all others of the *Clostridium* genus are bacteria of disease, notably those that cause tetanus and gas gangrene.

Nitrogen-fixing bacteria take the nitrogen directly from the air, combine it with hydrogen, and use this combination in building proteins. The root-dwelling type thrive only on the roots of leguminous plants like alfalfa, clover, beans, and peas (see Alfalfa). But they fix more nitrogen than these plants require, so the surplus is stored in the roots and passes into the soil when the plants are harvested or die. That is why leguminous crops are said to enrich the soil in which they grow.

Keeping Nitrogen in Circulation

Once the nitrogen has been built into living tissue, it may be used over and over again. Animals get their proteins either from plants directly or by devouring plant-eating animals. When a plant or animal dies, some of the bacteria of decay break up the protein, and the nitrogen emerges in the form of ammonia (NH₃). Part of this escapes into the air, but most of it is seized upon by another type of bacteria and turned into nitrites. And still another type of bacteria turns the nitrites into nitrates—ready to be used by plants in forming a new supply of proteins.

The bacteria that do this kind of work are called *nitrifying bacteria*, in distinction from the nitrogen-fixing bacteria. Unfortunately, there are also *denitrifying bacteria* which, during the decay of protein, set nitrogen free into the air again. And it is this continual loss that must be made up.

The processes by which nitrogen circulates between air and soil and among the different forms of life is

called the *nitrogen cycle*. A pictograph showing this cycle will be found with the article on Plant Life.

Fertilizers and Explosives

Wild plants die and give back their nitrogen to the soil where they grew. But our harvests are continually taking it away without return. That is one of the reasons why farmers must use fertilizers (*see Fertilizers*). Those that supply nitrogen include sodium nitrate, ammonium sulphate, and the waste products of animals and birds, like manure and guano.

Ammonium sulphate is a by-product of coke manufacture. Sodium nitrate, also called niter or Chile salt-peter, is found in vast deposits in the deserts along the western coast of South America. It accumulated there ages ago as the result of plant decay, and escaped being washed away when the climate changed to almost perpetual drought.

The reluctance of nitrogen to unite with other elements is matched by its readiness to break away from such unions whenever it gets the chance. Thus most nitrogen compounds are relatively unstable, and some of them break up with great violence. These are the sources of most of our explosives, including gunpowder, guncotton, dynamite, nitroglycerin, trinitrotoluol (TNT), and the several fulminates (*see Gunpowder; Explosives*).

Artificial Fixation of Nitrogen

The great demand for low-cost nitrogen compounds in making both fertilizers and explosives exceeds the supply from natural sources. For this reason industrial science has worked out several methods of artificial nitrogen fixation. Some of these are patterned after nature; others are products of the laboratory.

Electric Arc Process: This reproduces the effects of lightning. Air is blown through a gigantic electric arc; nitrogen and oxygen unite to make nitrogen peroxide gas, which then passes through a spray of water and forms nitric acid. Only where electric power can be generated at very low cost, as in Norway, is this method practical.

Cyanamide Process: Nitrogen is circulated over hot calcium carbide (CaC_2) with the result that the nitrogen replaces part of the carbon, forming calcium cyanamide (CaCN_2). This may be used directly as a fertilizer or may be treated with steam under pressure to produce ammonia.

Haber-Bosch Process: A mixture of nitrogen and hydrogen is subjected to tremendous pressure in the presence of a catalyst, usually a compound of iron. The two gases unite to form ammonia. Fritz Haber invented this process in Germany in 1913 and Karl Bosch improved it. It provided Germany with fertilizers and explosives when the supply of natural nitrates was cut off by war. The Casale process and the Claude process are variations of the Haber-Bosch technique. This method of nitrogen fixation is the most widely used.

Chemistry of Nitrogen

Nitrogen was first recognized as a distinct substance in 1772 by Daniel Rutherford of the University of Edinburgh. It is commercially prepared by evaporation of liquid air. The more volatile nitrogen comes off before the oxygen. One of the few direct uses of free nitrogen is in making

"gas-filled" electric lamps (*see Electric Light and Power*). But in the importance of its compounds it ranks next to the "big three"—carbon, hydrogen, and oxygen.

Its valence ranges from one to five, illustrated by its compounds with divalent oxygen: nitrous oxide (N_2O), nitric oxide (NO), nitrogen trioxide (N_2O_3), nitrogen peroxide (NO_2), and nitrogen pentoxide (N_2O_5). Most of its compounds, however, are formed with valences of three or five.

The two most widely known compounds of nitrogen are respectively an acid and a base—nitric acid and ammonia (*see Nitric Acid; Ammonia*). In the interesting compound ammonium nitrate (NH_4NO_3) both basic and acid nitrogen appear in the same molecule, with the ammonium part (NH_4) showing a valence of three and the nitrate part (NO_3) showing a valence of five.

Nitrogen combines with several of the metallic elements, such as magnesium and calcium, to form nitrides (Mg_3N_2) which react with water to yield ammonia. When carbon and nitrogen together combine with a metal, a cyanide is produced, like cyanide of potassium (KCN).

Organic Compounds of Nitrogen

As we have seen, the proteins are the most important of the organic compounds of nitrogen. They are built up in a unique manner from the amino acids which contain nitrogen in the amino combination— NH_2 (*see Biochemistry*). These acids are "amphoteric" substances, that is, they can act both as acids and bases. Thus the acid part of one amino acid molecule can combine with the basic part of another amino acid molecule, and so on, until several join together in forming the huge complex protein molecules.

There are few dyes that do not contain nitrogen. The formula for aniline ($\text{C}_6\text{H}_5\text{NH}_2$) reveals that it is formed from the benzene ring (C_6H_6) by substituting an amino group for one of the hydrogen atoms. The special value of the aniline dyes for silk and wool arises from their affinity for the proteins of which these animal fibers are composed. This affinity is responsible also for the effectiveness of many antiseptics and germicides containing nitrogen.

Most photographic developers contain nitrogen. So do many hypnotic drugs and the alkaloids, such as caffeine, quinine, and morphine. (*See also Chemistry; Anesthetics.*)

NOBEL (nō-bēl') PRIZES. Alfred Bernhard Nobel (1833–1896), a Swedish chemist and munitions maker, left most of his fortune to provide five annual prizes for the persons making the greatest contribution to the progress of the world in physics, chemistry, medicine, literature, and peace. The awards were first made in 1901. The peace prize is awarded by a committee chosen by the Norwegian parliament. The other prizes are awarded by three Swedish learned societies.

American prize winners have been Theodore Roosevelt, Elihu Root, Woodrow Wilson, Charles G. Dawes, Frank B. Kellogg, and Jane Addams and Nicholas Murray Butler, for peace; Alexis Carrel, Karl Landsteiner, Thomas H. Morgan, George R. Minot, William P. Murphy, and George H. Whipple, in medicine; Theodore W. Richards, D. Irving Langmuir, and Harold C. Urey, in chemistry; Albert A. Michelson, Robert A. Millikan, Arthur H. Compton, Carl D. Anderson, Clinton J. Davisson, and Ernest O. Lawrence, in physics; and Sinclair Lewis, Eugene O'Neill, and Pearl Buck, in literature. Among others given the prize for



ALFRED NOBEL

literary work have been Rudyard Kipling, Maurice Maeterlinck, Romain Rolland, Knut Hamsun, William Butler Yeats, George Bernard Shaw, Thomas Mann, and John Galsworthy. Several European women have won prizes: Madame Marie Curie, in both physics and chemistry; her daughter, Irene Joliot-Curie, in chemistry; Selma Lagerlöf, Grazia Deledda, and Sigrid Undset, in literature; and Baroness Bertha von Suttner, for peace.

The value of each prize originally was about \$40,000, but the sum has varied considerably according to the income from the fund. Because of war in Europe, the awards were suspended in 1940.

NORFOLK, VA. Since colonial days, Norfolk and its surrounding territory have been a cornerstone of defense of American shores. The city is situated on Hampton Roads, the great natural harbor which it shares with Portsmouth, Newport News, and Hampton (see Fact-Index). This harbor is the channel through which the James, Nansemond, and Elizabeth rivers flow into Chesapeake Bay, and these cities thus dominate a strategic approach on the Atlantic coast.

The chief military establishments in the area are the United States Naval Operating Base, in Norfolk; the Norfolk Navy Yard, on the Portsmouth side of the Elizabeth River; and Langley Field, near Hampton, an important army air base. The port of Norfolk is joined with those of Portsmouth and Newport News to form a single customs unit—the Port of Hampton Roads. This port ships coal, scrap iron, grain, tobacco and tobacco products, and lumber. Among its imports are wood pulp, ore, petroleum products, and sugar.

Norfolk's development as a great maritime city came with the advance of railroads, which made it the water outlet for the rich Virginia back country. It is now a giant rail and water terminus, served by eight trunk railways and many foreign and domestic steamship lines. Spurred by the growth of its shipping trade, it became one of the leading industrial cities of the South. Its factories produce fertilizers, agricultural implements, lumber, and cotton and silk goods. It is one of the world's chief sources of roasted peanuts, and it is the center for a vast sea-food industry. Despite its emphasis on business, the city is known as a resort to thousands of visitors, who come here to swim, hunt, and ride horseback.

Norfolk was settled in 1682. During the Revolution, in January and February 1776, it was completely burned except for St. Paul's Church (built in 1739). Since 1919 the city has had a city-manager form of government. Population (1940 census), 144,332.

NORMANDY, FRANCE. To think of Normandy is to think of a shimmering stream through a grassy woodland, a sunlit apple orchard brilliant in the spring with white and pink blossoms, a trim little farmhouse hidden behind towering trees; for this ancient province on the northern coast of France is one of the country's most beautiful regions. Across the channel from its shores lies England, whose history for centuries was intertwined with that of this lovely land.

"Normandy" means "land of the Northmen." These terrifying Vikings invaded the region in the 9th century, steering their dragon-prowed ships up the Seine, and spreading fire and sword along its banks far inland to Paris (for picture, see Northmen). In 911 Charles the Simple concluded a treaty of peace with their chief, Rollo, which granted them a large part of Normandy; they later took the rest.

Exploits of the Norman Nobles

With their marvelous facility for adaptation, the Northmen within a century became patriotic Frenchmen. Abandoning their fierce ways, they took up the French language and the Christian religion. But they retained their old fondness for travel and adventure. Five stalwart sons of one Norman family found their way to Italy, where they established a kingdom in the south. The dukes of Normandy meanwhile rose in power until one of them, William, crossed the channel and took possession of England in 1066 (see William, Kings of England).

William, though conqueror, wisely blended his Norman traditions with the existing institutions of England. In time England, where the seat of power now resided, came to own Normandy. Leaders of Normandy then rebelled and called in the French kings. Disorder and confusion followed until the French king Philip Augustus conquered Normandy from King John of England. The struggle was renewed in the Hundred Years' War (1337-1453), which ended in the expulsion of the English, though at a terrible cost. Thereafter Normandy's history, merging with that of all France, was less eventful.

But these early centuries of stirring history left their marks on the land. At Mont St. Michel, the rocky island off the coast, is the famous fortress-abbey where politics and religion were mingled in intrigues and wars. In the ancient city of Caen, on the Orne River, are the Abbey for Men and the Abbey for Women, built by William the Conqueror and his wife Matilda to pacify the pope who disapproved their marriage. Near Caen is placid little Bayeux, where is kept the famous Bayeux "tapestry" depicting in embroidery the incidents in the Norman conquest of England. The most historic city in Normandy, however, is Rouen, on the Seine, the ancient stronghold of the Northmen. Here a simple slab marks the spot where Joan of Arc was burned at the stake. Here too is a fine Gothic cathedral, in which Henry II of England lies buried, and where also is entombed the lion heart of his son Richard I.

Ports, Products, and People

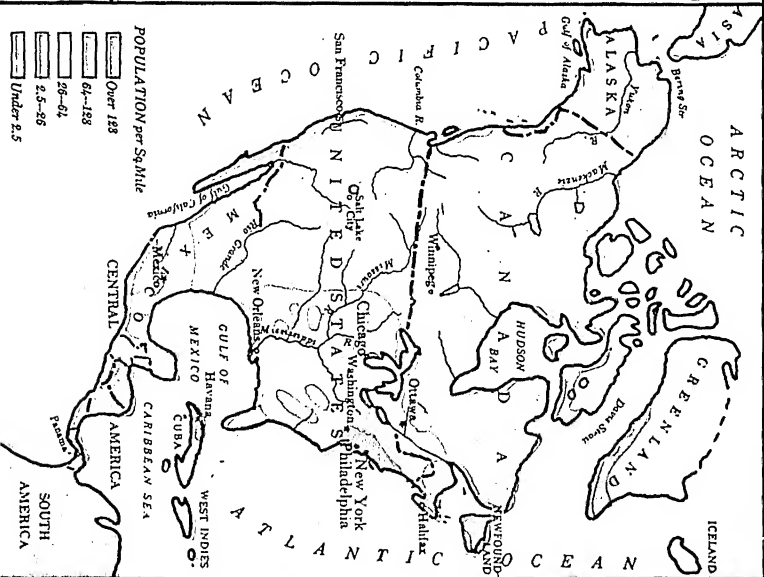
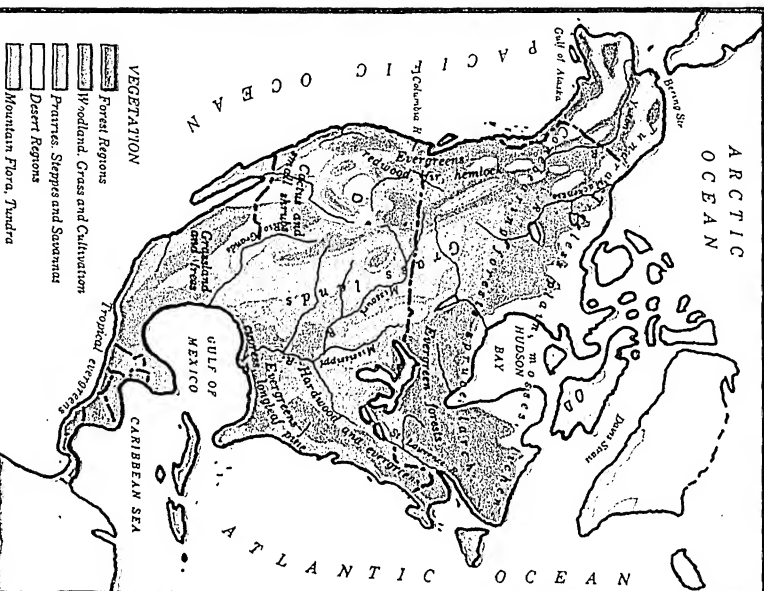
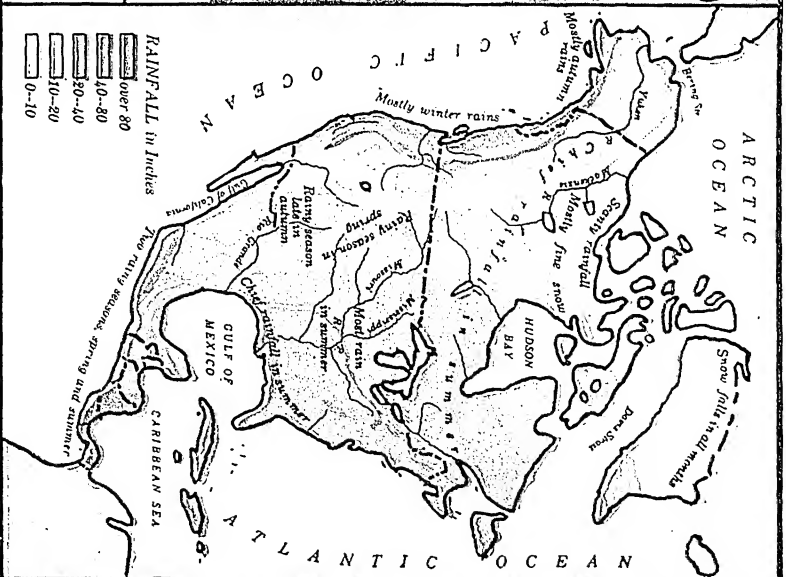
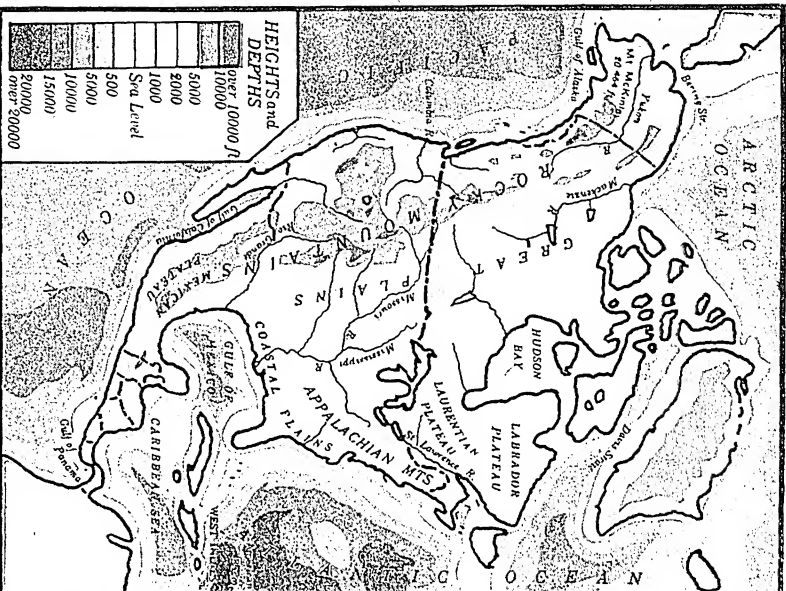
Normandy has some of the finest harbors in France. Among them are Le Havre at the mouth of the Seine; Cherbourg, at the tip of the peninsula of Cotentin; and Dieppe, in the northeast. The region is famous for its cider and its fine textiles and laces.

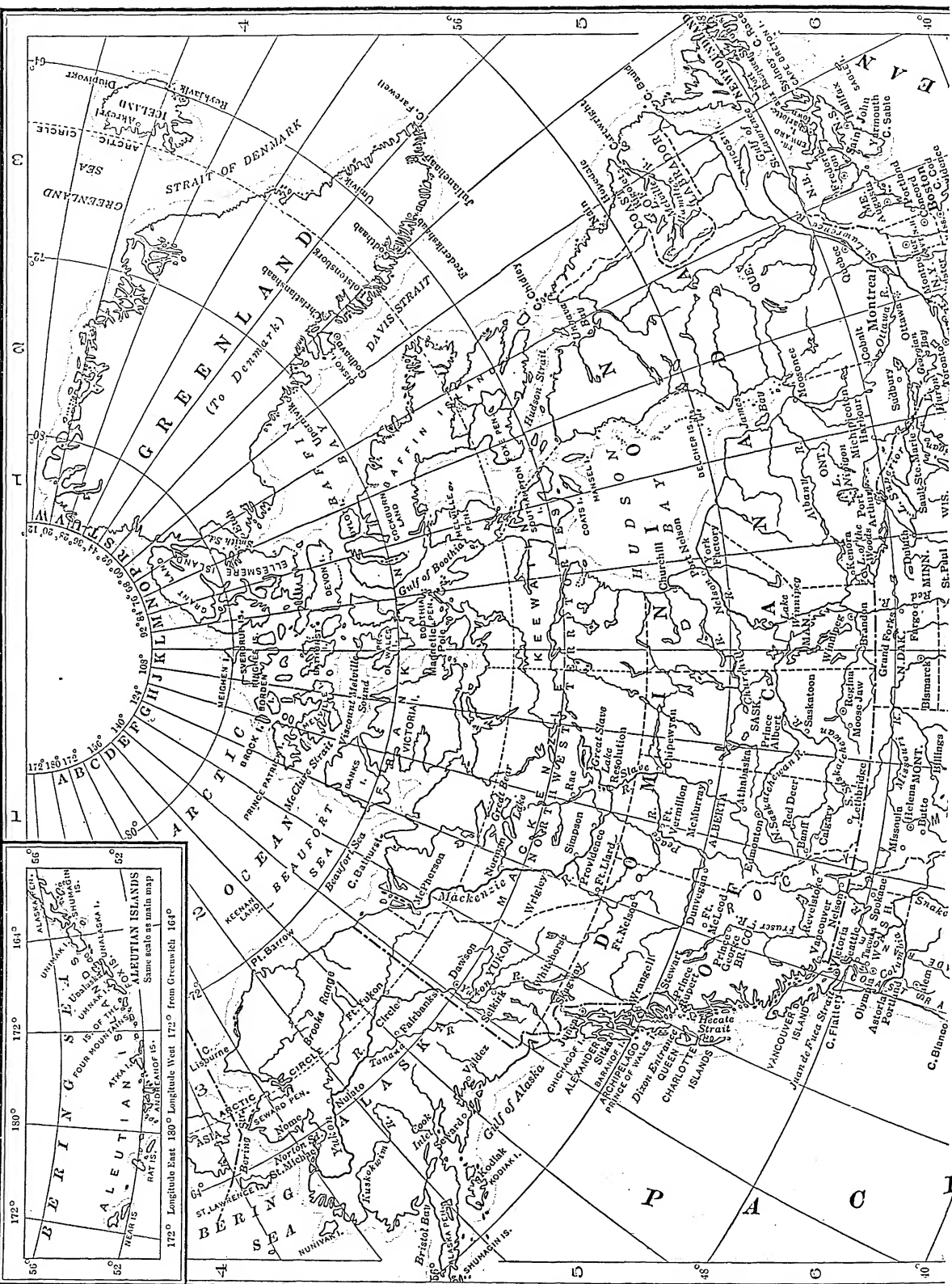
The people of this old province are mostly tall, blue-eyed, and fair-haired, showing their descent from the Northmen. They are among the most hardy and industrious inhabitants of France.

As if the very mountains themselves had anticipated the spirit of the pioneers, we find the old worn-down ranges in the east and the young lofty mountains in the west. In the upper map on the right you can pick out the well-watered regions and those which are shut off by mountain barriers from the moisture-laden sea winds. The maps below strikingly show how the typical vegetation of the different regions and the relative density of population are in large part determined by these natural conditions. The greatest concentration of population is, as you see, about the seacoasts and the Great Lakes and Mississippi valley regions.



FACTS YOU SHOULD KNOW ABOUT NORTH AMERICA





The first check encountered by American expansion was the Appalachian Mountains, which extend in a long and practically unbroken chain from the Gulf of St. Lawrence almost to the present Gulf States. In these days of steam we are not accustomed to think of these moderately high wooded ridges as barriers, but to regard them rather as storehouses of vast wealth in lumber, coal, and iron, and other natural resources. In colonial days, however, highways were lacking and this back-country was inhabited by Indians who fought doggedly to preserve their hunting grounds. For 150 years the English colonists were thus hemmed in on the seaboard. Nevertheless the nation owes much to the Appalachian barrier. It held together the 13 colonies when they might otherwise have scattered, and thus promoted the sound growth in strength and population which made possible the winning of the Revolution, and after that the organization of the United States.

Great Lakes and Great Rivers

French explorers who penetrated the interior found that the wide St. Lawrence River led to the largest bodies of fresh water in the world, the chain of the Great Lakes. Their great size makes them resemble inland seas, and they have a similar effect upon the climate of the region about them. Not only are they invaluable for transportation, but they lend charm to the surrounding country, and give to eastern America its greatest natural wonder—the Niagara Falls. Streams flowing into Lake Michigan brought them within easy portage distance of other streams flowing into “the Father of Waters,” as the Indians called the Mississippi, and thus opened to them the heart of the continent.

Here they found one of the great river systems of the world, extending 4,200 miles from the headwaters of the Missouri to the mouth of the Mississippi. With their tributaries, these rivers afford inland transportation for more than 14,000 miles and drain an area of 1,240,050 square miles.

Nowhere else does a single river give access to such valuable agricultural territory; for no other continent has anything comparable to the vast heart of America, the great fertile plain of the Mississippi valley, broken only by the faint traceries of its winding streams. From the Arctic Ocean to the Gulf of Mexico, one may travel without passing any elevation of more than 1,000 feet above sea-level; for in the middle of the continent the river valley merges with the Great Lakes plain, which farther north blends with the valley of the Mackenzie River, flowing to the Arctic Ocean. At the end of the 18th century the United States and Canada began to push their settlements westward into this great plain; and in little more than 50 years all but the cold northern region was brought under settlement. Numerous railroads connect it with the east, and the Mississippi River, the Great Lakes, and the Erie Canal convey the crops of its fertile lands to the seashore and so to the markets of Europe.

After sweeping over the central plain, the pioneers found themselves confronted by broad plateaus, crested by the many high ranges which are known collectively as the Cordilleras. These chains enter the continent in Alaska, broadening as they pass through Canada, and attaining their greatest width in the United States, where the great table-land is in some places 1,000 miles in breadth. All of Mexico except a narrow coastal plain is a part of this vast plateau, but there the mountains are lower on the whole, and the rainfall is greater. In southern Mexico occurs a break in the long system, known as the Isthmus of Tehuantepec; but in Central America the mountains rise again, fringing the western coast.

This Cordilleran region is the scenic wonderland of America. In Alaska are glaciers more marvelous than those of the Alps; and Mount McKinley, the highest peak on the continent, raises its head almost 5,000 feet above Mount Blanc, the highest mountain in western Europe. The Cascades and Sierra Nevadas which lie near the coast of Canada and the United States present some of the most magnificent mountain scenery in the world; and in the Rocky Mountains is a region of geysers and hot springs, part of which are preserved for visitors in Yellowstone National Park. Farther south lies the “Dead Sea” of America—the Great Salt Lake; and still farther southward, the most wonderful river canyon known to man—the Grand Canyon of the Colorado River. In Mexico and Central America are mighty volcanoes which vomit forth lava, sulphur, and red-hot stones.

Natural Wealth on Every Hand

From Alaska down to the Isthmus of Panama, the Cordilleras contain rich veins of gold, silver, lead, and copper without which it would have been years before men settled this wonderland. No navigable streams lead to the region except the Missouri, and even it will not take one within several hundred miles of the mountain wall. Moreover, the plain country which leads to the mountains is so dry that it did not tempt farmers from the well-watered central valley; and at several places in the central basin are great cactus-covered deserts. In addition, over the whole region roamed tribes of warlike Indians. But as gold had lured men into the mountains of Mexico, so it lured them to the Pacific shore of the United States and Canada, and later to Alaska; and so potent was the charm that in less than half the time it took to conquer the Appalachians, men had crossed deserts and mountains and established their settlements on the far distant Pacific slope.

When man had finally penetrated every corner of this continent, he found few places which could not contribute something to his needs. The only considerable exception is the extremely cold north, where the numerous icy islands of the Arctic Archipelago stretch away to a point only 450 miles from the North Pole. In these low “tundra” regions there is little vegetation, and no considerable animal life except in the sea, from which the Eskimos derive their sole support. On the

whole it has been estimated that the barren lands of North America, including the few desert regions, comprise only two per cent of its entire area. Large areas in northern Canada and Alaska, in addition to the Rocky Mountain and Appalachian regions (in all, one-fifth of the continent) are covered with valuable forests. The semi-arid regions of the west (comprising one-fourth of the entire continent) are at least suitable for grazing. Approximately half of North America is excellent for agriculture. Regions once thought suitable only for grazing have been brought under cultivation by dry farming and irrigation, and much additional land could be farmed by these methods.

Although North America contains less than one-tenth of the earth's people, it is a land of enormous wealth. It furnishes about one-fifth of the entire world's supply of wheat, half of its cotton crop, and over half of its corn. Of the precious metals, it contributes about one-fourth of the gold and about two-thirds of the silver of the world; and in the so-called "base"—though really more precious—metals, no other continent rivals it. Of iron, the most important of the metals, North America produces more than one-fourth of the world's supply. Its coal deposits, richer than those of any other continent with the possible exception of Asia, furnish almost a third of the world's coal production. North America also contributes two-thirds of the world's petroleum and nearly half of its copper production.

This magnificent continent was not always as we now see it, or even as the first white men found it. Millions of years were required to prepare these beds of coal and iron, upon which rests our modern civilization, and to build up the land from which we now get such rich agricultural yields. During these countless ages this firmest land has undergone a vast series of progressive changes, which have left their records in the rocks to be learned by the careful student.

How the Great Continent Rose Out of the Sea

Like other continents, North America consists of a broad fold of the earth's crust, only a part of which rises above the level of the sea. In very ancient times, when this uprising fold first appeared above the surface of the waters, it did not appear as a single united land. The tops of the mountains appeared first, making groups of islands of varied size, like the West Indies. We do not know just where these islands were; but it seems clear that they included the Appalachian Mountains and the Laurentian highland in Canada, and that these first upheavals were followed much later by the Cordilleras. Until comparatively recent geological times the Mississippi valley was entirely under water, forming a sea that extended from what is now the Gulf of Mexico all the way to the Arctic Ocean. In the limestone rock of this region are found many fossil remains of sea animals—shells, corals, and fish—deposited in early times when the land was covered with water.

Gradually, because of the rising of the original islands or the receding of the ocean, the "Mississippi

Sea" became more shallow. Wind and rain cut down the mountains, and the sediment which the rivers carried from them filled up this inner sea, forming the deltas and flood plains which are now among the most fertile lands of the country. Finally the various archipelagoes were united into one great land.

Ages after the beginning, when the climate was much warmer and wetter than it is now, occurred what is called the Coal Period. Extensive swamps filled with tall fernlike growths covered much of the continent like a tropical jungle, extending as far north as the Arctic Circle. The land was still in an unstable condition, and after these forests had grown a few hundreds of years, the plains sank beneath the sea, and layers of mud, sand, and gravel collected over them. In time these layers became solid rock, and the vegetation beneath was changed to coal. Then the land rose again and new forests grew, causing one layer of coal to be formed over another. All this time, and at other periods, deposits of iron, copper, gold, and silver were also being laid down. Many minerals were brought by hot water and deposited in cracks in the mountain rock, where they hardened forming what are called mineral veins.

When the Ice Sheet Covered the Land

In more recent geologic times the continent experienced another wonderful change. The climate for some reason became much colder, just as in the Coal Period it was much warmer. A vast sheet of ice appeared in the north, and crept slowly southward, covering a large part of Alaska and Canada, and about one-third of the United States (*see* Ice Age). Thousands of years were required in its slow advance and thousands more for its disappearance; indeed, we may say that we are still in the Ice Age, since remnants of the ice cap still cover the greater part of Greenland and parts of Arctic North America. No one can say why it came, but there are many evidences of what it has done. It scoured the rocks over which it passed like a mighty planer, and swept away the soil that covered the land. It deposited bits of ground-up rock called "drift," which produced a fertile soil in many places; but sometimes it failed to grind up the rock, and then we have boulders and pebbles, as in New England, which greatly hinder the farmer. Moreover, it blocked up the courses of former rivers, which in finding new paths created waterfalls of inestimable value to manufacturers; and it dug out and left great hollows, which are now the lakes and ponds of northeastern North America. Even our Great Lakes we owe largely to this glacial action.

But the most important work of these millions of years—that which was to have most influence on our climate, and therefore on our crops—was the forming of the mountain systems. The Laurentian and Appalachian mountains, as stated, rose in very early ages; and since then they have been slowly worn away by weather and water. Being low, they allow winds to carry much moisture over them; and since there are no mountains toward the south, winds can also enter

freely from that direction. The lack of barriers toward the north contributes little to the rainfall, but has a considerable effect upon the climate, allowing full sweep for cold waves from the frozen Arctic Ocean. The Cordilleras are younger than the more eastern mountains, and considerably higher. They are, in fact, still growing, as is seen by the earthquakes caused now and again when they crack under the great strain. When winds from the west reach these lofty mountain ranges, they are forced to drop much of their moisture; and when they finally reach the eastern side they have little left. This causes the great plains and plateaus of the western regions to be dry or arid.

Of great importance in its effect on commerce is the fact that the coast of North America is slowly sinking in the north and rising in the south. A sinking coast allows the ocean to enter the lowlands,

leaving the higher land to form peninsulas and islands, while the valleys make bays and inlets. Thus on the Pacific coast, north of Seattle, we find a very ragged outline; in the Arctic north are great islands and peninsulas; and on the Atlantic seaboard is a very irregular coast as far south as New York. These indentations have given rise to many important cities on the Atlantic coast, because of the excellent harbors which the submerged river valleys have made. But south of New York and Seattle the dominating movement of recent times has been upward. A large part of the Southern states, bordering on the Atlantic and the Gulf of Mexico, was once part of the ocean bottom or "continental shelf." This shelf is still rising, with the result that there are few good natural harbors on the Atlantic coast below New York, and, with the exception of San Diego, none below San Francisco on the Pacific.

—REFERENCE-OUTLINE for Organized Study of NORTH AMERICA—

THE DISCOVERY of the broad North American continent 400 years ago came like the gift of a promised land to the crowded nations of Europe. Its harbors opened to ships bearing settlers across the Atlantic. Its climate, in the main, was similar to that in which they had lived and worked at home. Its soil grew the plants they knew how to cultivate, and furnished new crops to add to the world's food supply. Its rivers made easy highways for settlers, their goods and produce, and furnished water power to run the mills they built. Its hills gave forth rich stores of minerals and its forests offered a seemingly inexhaustible lumber supply. The progress of the Industrial Revolution aided an able, determined body of settlers to develop this continent more rapidly than any other. With little over three centuries of history, it has made many unique contributions to world civilization. For more detailed information on North America see the Reference-Outlines for United States, Canada, and Mexico.

I. PHYSIOGRAPHY AND GEOLOGY:

- A. Evolution of the Continent: N-152-3, C-284, A-230.
- B. Ice Age in North America: I-2-3, N-152, C-271. Extent of the Ice Sheet G-96, G-176; Effects of the Moving Glaciers L-55, O-213, M-191, I-45.
- C. North America's Coast Line: Influence on Exploration N-150; Origin of N-153, B-244.
- D. Mountain Ranges, Plateaus, Plains: N-150 map, N-151, A-146, U-182-3, C-50-1, C-131-2.
 - a. Laurentian Plateau: L-72.
 - b. Appalachians: A-230. Piedmont Plateau G-55, G-31 (Fact-Index); Great Smoky Mountains G-150b.
 - c. Ozark Plateau: O-266, M-207, A-295, O-218.
 - d. Cordilleran System: N-153, R-123-4.
 - e. Great Basin: U-182.
 - f. Great Mexican Plateau: M-132b-133.
 - g. Volcanoes: V-332, C-132, A-101, S-19.
 - h. Great Central Plain: M-204, P-200.
 - i. Coastal Plains: Atlantic Coastal P-200; Gulf Coastal M-133, G-184.
- E. Chief Rivers and Lakes: N-150, N-151, U-184, C-52.
 - a. St. Lawrence System and Great Lakes: S-7-8, G-146, S-331, M-155, H-362, E-300, O-227.
 - b. The Hudson River: H-350.
 - c. Mississippi-Missouri System: M-203, M-211, O-214.
 - d. Rio Grande System: R-109.
 - e. Colorado System: C-315

- f. Columbia System: C-315, O-244, W-29.
- g. Yukon System: C-52, Y-214.
- h. Mackenzie-Athabaska System: M-12, C-52.
- i. Nelson-Saskatchewan System: C-52, S-31, R-62.

F. Desert Regions: N-152.

II. CLIMATE AND RAINFALL: N-150-2, C-270a-b.

- A. Far North: Labrador L-46; Alaska and the Yukon A-102, Y-214; Arctic Circle A-278.
- B. Typical Temperate Zone: Climate of Great Central Plain U-190, C-270a, G-146b; Atlantic Coast and Gulf Plain U-191, G-184; Pacific Coast U-191.
- C. Mexico and Central America: M-134, C-131, C-132, G-181a-d, N-141.
- D. Rainfall: R-47-8, U-191, N-150 map. Effect of Mountains N-152-3, C-270b, C-54.

III. VEGETATION: F-154-9, N-152, T-133-4, U-194.

Note: The number of small flowering plants and grasses which are native to North America is so great that it would be impossible to list them here. We shall therefore confine ourselves with few exceptions to the characteristic trees and shrubs of the various regions.

- A. The Far North: L-46, A-277-8, A-100. Alder A-113; Birches B-119; Junipers J-228; Reindeer Moss L-122; White Pine P-220; Sitka Spruce S-264; Tamarack L-64-5, L-64 picture, E-340.
- B. The Temperate Regions: A-230. Alder A-113; Ash A-323; Quaking Asp P-303 picture; Beech B-78; Birches B-119; Bittersweet B-151; Buckeye B-257; Butternut B-286; Catalpa C-98; Red Cedar J-229; Chestnut C-184-5; Chinquapin C-222; Cottonwood P-304; Dogwood D-85; Elder E-213; Elm E-256-7; Eucalyptus E-314-5; Fir—Balsam, Douglas, and Silver F-44; Hazel H-253; Hemlock—Western and Canadian H-271; Hickory H-289-91; Holly H-323; Juniper J-228-9; Laurel L-72; Linden, or Basswood L-148; Locust L-179; Maples M-54; Red Mulberry M-298; Oaks—Red, White, and Bur, or Pin O-189; Papaw T-133; Pecan P-99-100; Persimmons P-136; Pines—Yellow, Loblolly, and Western Yellow P-219-21; Poplars—Balsam P-303-4; Redwoods S-80; Sagebrush S-3; Sassafras T-133; Sequoias S-79-80; Spruces S-264; Sumac S-324-5; Sycamore S-360; Tamarack L-65; Tulip Tree T-149; Tupelo, or Sour Gum T-133; Walnuts—Black and English W-5; Willows W-104b-5; Witch-Hazel W-128.
- C. Tropical and Semitropical Regions: Agave or Maguey A-46; Bamboo B-35; Banana B-36-8; Brazilwood I-79; Cacao C-10; Cactus C-10; Cane S-319-20; Coffee C-296; Bald Cypress C-420; Ebony E-143; Tree Ferns F-24; Guayule G-181d; Logwood L-180; Magnolia M-35-6;

Mahogany M-36-7; Live Oak O-189; Orchids O-243; Palmettos and Palms P-37; Rosewood P-124; Rubber R-163; Sapodilla C-185; Yucca Y-211.

D. New Plants of Economic Value Found by the Early Explorers: A-146.

IV. ANIMAL LIFE:

A. New Animals Found by the Explorers: A-146.

B. Lack of Native Animals Capable of Domestication: A-146.

C. Mammals: M-44.

- a. Deer Family: D-35-7. American Elk or Wapiti W-7; Moose M-257; Caribou or Reindeer A-106 picture.
- b. Ox, Sheep, and Antelope Group: S-104-6, A-218. Bison or "Buffalo" B-148-50; Musk Ox M-323; Rocky Mountain Sheep S-104; Rocky Mountain Goat and Pronghorn Antelope A-218.
- c. Dog Family: Coyote and Gray Wolf W-128; Red, Silver, Arctic, and Gray Fox F-165.
- d. Bear Family: B-67-9.
- e. Weasel Family: American Marten M-72; Badger B-13; Ferret F-26; Mink M-189; Otter O-255; Skunk S-157; Weasel W-59; Wolverine W-130.
- f. Cat Family: C-96. Cougar, Puma, or Mountain Lion P-365-6; Jaguar J-181; Canada Lynx, and Wildcat or Bobcat L-223; Ocelot L-98a.
- g. Rodents: R-124. Beaver B-70-2; Chipmunk C-222; Gopher G-120-1; Hares and Rabbits H-221; Jumping Mouse H-289; Kangaroo Rat R-51; Mouse M-293; Muskrat M-324; Porcupine P-304d; Prairie-dog P-342; Rat R-51; Squirrel S-265-6; Woodchuck G-179.
- h. Other Mammal Groups: Armadillo A-301; Brown and Red Bat B-64; Mole and Shrew M-216-7; Opossum O-235; Peccary P-100, H-316 picture; Raccoon R-9.

D. Birds: B-120-40. Some Birds Peculiar to North America A-146; American Flycatchers F-129-30; Baltimore Oriole O-250 picture, O-251; Bobolink B-166; Catbird N-32 picture; Cowbird B-153, B-124 picture; Mocking-bird M-212, B-139 picture; Robin R-117, B-140 picture; Sage Hen G-181; Wild Turkey T-158; Flamingo F-103; Toucan T-116.

E. Reptiles and Amphibians: R-78, S-169-73. Alligator A-129; American Toad T-100; Copperhead C-361, S-170 picture; Coral Snake S-172, S-170 picture; Crocodile C-399; Frog F-207-9; Horned Toad and Gila Monster L-171, Iguanas I-11; Moccasin M-212, S-170 picture; Rattlesnakes R-52; Salamanders, Newts, or Water-dogs S-12-13; Turtle T-166-7.

F. Fish: F-67-75. Striped Bass, Bluefish, and Cod F-74; Eel E-191; Flounder F-117, F-104; Flying-fish F-130; Haddock H-194; Halibut H-200; Mackerel M-12; Perch P-122; Pompano and Redfish F-75; Salmon S-13; Sawfish S-33; Shad S-94; Sharks S-102-3; Skates or Rays S-154; Smelt F-75; Stickleback S-289; Sunfish F-75; Swordfish S-359; Tarpon T-14; Tilefish F-75; Trout T-145; Tunny T-154; Whitefish W-85.

G. Insects and Allied Groups I-81-93.

Note: The number of North American insects and similar creatures is so great that we shall list here only those which, by their depredations, play an important part in the agricultural life of the continent.

—Aphids A-226; Army Worm A-308; Beetles B-80-5; Cankerworm C-72; Chinch Bug C-222; Codlin Moth C-294; Cutworm C-418; Grasshoppers G-140; Hessian Fly H-287; June Bug J-228; Locusts L-179; Potato-bug P-326; Weevils W-65.

V. NATURAL RESOURCES: N-151-2.

VI. DISCOVERY AND EXPLORATION: A-141-6.

- A. Early Visits of the Northmen: N-168.
- B. Columbus and His Voyages: C-316-9.
- C. How America Got Its Name: V-290.
- D. Three Hundred Years of Exploration: A-142-6.
 - a. John Cabot: C-9, C-58.
 - b. Search for the "Northwest Passage": C-59.

c. Ponce de Leon: P-302, F-109.

d. Balboa Discovers the Pacific: B-15-16.

e. Conquests of Cortez: C-372-3, C-133c.

f. Cartier Opens Canada for France: C-89-90.

g. De Soto and the Lower Mississippi: D-55-6.

h. Coronado, the First White Man on the Great Plains: C-370.

i. Sir Francis Drake: D-90.

j. Sir Walter Raleigh in the New World: R-49.

k. Henry Hudson and His Discoveries: H-348, C-59.

l. Champlain and the Founding of Quebec: C-138-9.

m. Exploration of the Mississippi: M-203. Marquette

M-67; Joliet J-226; La Salle L-66; Hennepin H-274.

n. Daniel Boone Penetrates the Wilderness: B-192.

o. Lewis and Clark Expedition: L-99.

E. Influence of Physical Conditions of the Land on Exploration and Expansion: N-150-1.

VII. PEOPLES OF NORTH AMERICA:

A. Prehistoric Races and Their Remains: A-147-9, N-150, I-52. Mound-Builders M-291; Cliff Dwellers C-269-70; Toltec Empire in Mexico A-147-9; Mayan Ruins in Yucatan, Guatemala, and Honduras A-147-9, Y-210-11.

B. Natives Found by White Men: A-146. Eskimos E-300, A-103; Northern Indians I-52; Aztecs A-408-10, M-138; Mayas Y-210-11; Central American Aborigines H-330.

C. Early Settlers: See Reference-Outlines for United States, Canada, and Mexico.

D. Later Immigration: I-22-4, M-168, U-183 picture, C-59.

E. Negroes Imported as Slaves: N-62, C-249.

F. Distribution of Population: N-150 map.

Central America

I. POSITION AND PHYSIOGRAPHY: C-131-2 and map.

A. Contrasting Regions: Mountainous Backbone N-151, C-131, G-181a; Caribbean Coastal Region C-131, G-181c; Pacific Region C-132, G-181c, N-141.

B. Volcanoes and Their Effects: C-132, N-141, S-19.

II. THE CLIMATE: C-131-2.

III. PLANT AND ANIMAL LIFE: C-132.

IV. RESOURCES AND PRODUCTS: C-131-2, C-133b, C-374, G-181b, c, H-330, N-141, P-39, S-18.

A. Hot Lowlands: Bananas B-36; Chicle C-185; Logwood L-180; Mahogany M-36; Coconuts C-292.

B. Uplands: Coffee C-296, C-132; Cacao C-10; Cattle C-132.

V. TRANSPORTATION AND TRADE:

A. Roads, Railroads, Air Service: C-133c.

B. Panama Canal: P-52.

C. Foreign Trade: C-133b.

VI. THE PEOPLE: C-132-3, L67d-g.

A. Early Indians: C-132, A-147; Mayas Y-210, G-181d.

B. Modern Peoples and How They Live: C-133, G-181b.

VII. EDUCATION, LITERATURE: C-133a, L-67j-m.

VIII. POLITICAL DIVISIONS: Guatemala G-181a; Honduras and British Honduras H-330; El Salvador S-18; Nicaragua N-140; Costa Rica C-374; Panama P-39.

IX. HISTORY:

A. Discovery and Conquest: C-133c, B-15, C-374, H-330, S-19.

B. Struggles for Independence and Establishment of Republics: C-133c, C-374, P-40.

C. Revolutions: C-133d, C-374, G-182, H-330, N-141.

D. Building of the Panama Canal: P-41.

West Indies

I. POSITION, PHYSIOGRAPHY, CLIMATE: W-72-72f, map W-72b-c. Bahamas B-15; Greater Antilles C-410, H-197, S-27, J-181, P-307; Lesser Antilles B-45, T-141, V-309.

II. RESOURCES AND INDUSTRIES: W-72f. See also articles on separate islands listed under III below.

III. POLITICAL DIVISIONS: W-72e, map W-72b-c.

A. The Bahamas (British): B-15.

B. The Greater Antilles: map W-72b-c. Cuba C-410, Haiti H-197, and Santo Domingo S-27, all independent; Jamaica (British) J-181; Puerto Rico (U. S.) P-307.

- C. Lesser Antilles: W-72, map W-72c. Leeward Islands (Fact-Index)—Guadeloupe (French) G-181, Virgin Islands (U.S.) V-309; Windward Islands (Fact-Index)—Barbados (British) B-45, Trinidad and Tobago (British) T-141-2, Martinique (French) M-72; Curaçao Group (Dutch) (Fact-Index).

IV. PEOPLE: W-72e-f.

V. HISTORY:

- A. Discovery by Columbus: C-319, W-72, B-15, C-412, H-198, J-182, M-72, P-311, T-142, V-309.
 B. Conquest and Settlement by Spain: L-67, W-72, C-412, J-182, P-311, P-302, T-142.
 C. Conquest and Colonization by France and England: M-72, J-182, B-45, T-142.
 D. Popular Revolts Against Foreign Rule: P-311, C-412, H-198, S-234.
 E. United States Intervenes in the Caribbean: C-412, S-27, C-84. Spanish-American War S-234-5; Haiti Becomes Ward of United States H-198; Virgin Islands Purchased from Denmark V-309.

Bibliography for North America

—Books for Younger Readers:

Adams, R. G. *Gateway to American History* (Little, 1927).

Allen, N. B. *Geographical and Industrial Studies: North America* (Ginn, 1935).

Burbank, Addison. *Cedar Deer* (Coward, 1940).

Carpenter, F. G. *North America* (Amer. Bk. Co., 1935).

Dalglish, Alice. *America Begins* (Scribner, 1938).

Mitchell, L. S. *North America* (Macmillan, 1931).

Quinn, Vernon. *Picture Map Geography of Mexico, Central America and the West Indies* (Stokes, 1943).

Sondergaard, Arensa. *My First Geography of the Americas* (Little, 1942).

Stefansson, Evelyn. *Here Is Alaska* (Scribner, 1943).

Stull, DeForest and Hatch, R. W. *Journeys through North America* (Allyn, 1941).

—Books for Advanced Students and Teachers:

Colby, M. E. *Guide to Alaska* (Macmillan, 1939).

Huntington, Ellsworth. *Red Man's Continent* (Yale Univ. Press, 1921).

McCarty, H. H. *The Geographical Basis of American Economic Life* (Harper, 1940).

Peck, A. M. and Johnson, Enid. *Roundabout America* (Harper, 1933).

Priestley, H. I. *Coming of the White Man* (Macmillan, 1929).

Roberts, W. A. *The Caribbean* (Bobbs, 1940).

Smith, J. R. *Men and Resources* (Harcourt, 1937).

Smith, J. R. and Phillips, M. O. *North America* (Harcourt, 1942).

Vandercook, J. W. *Caribbee Cruise* (Reynal, 1938).

Wilson, C. M. *Central America* (Holt, 1941).

See also bibliographies for Canada, Mexico, and the United States.

NORTH CAROLINA, the "OLD NORTH STATE"



NORTH CAROLINA.

This was the spot in the New World first occupied by England, and here was the birthplace of the first Anglo-American child, Virginia Dare; and North Carolina is still a state where the English-speaking stock

is almost untouched by foreign elements. The region is typical of all the New World that was to come under England's rule, for the state holds within its boundaries a bit of almost everything that the whole Atlantic coast possesses. In addition to the low sandy lands visited by the early explorers sent out by Raleigh in 1584, North Carolina possesses the highest mountains of the Appalachian chain, contains many of the minerals of North America (though in small quantities), and almost every variety of

Extent.—North to south, 188 miles; east to west, 503 miles. Area, 52,712 square miles, including 3,570 square miles of water surface. Population (1940 census), 3,571,623.

Natural Features.—Coast line protected by barrier reefs, behind which are Albemarle Sound and Pamlico Sound. Roanoke, Tar, Neuse, and Cape Fear rivers cross Coastal Plain. Yadkin and Catawba rivers traverse Piedmont. Blue Ridge and Great Smoky or Unaka mountains in the west (highest point, Mount Mitchell, 6,684 feet). Mean annual temperature, 59°; mean annual precipitation, 49".

Products.—Cotton and cottonseed products, tobacco, corn, peanuts, rye, potatoes, soy beans, cowpeas, fruit; cattle, dairy products, sheep, hogs; copper, mica, stone, feldspar, granite; cigarettes, cotton and knit goods, rayon, furniture, lumber products, fertilizer.

Cities.—Charlotte (100,899), Winston-Salem (79,815); Durham, Greensboro, Asheville (over 50,000); Raleigh (capital, 46,897).

tree known to the temperate zone. It is still one of the richest collecting grounds for botanists, and yields all the important crops grown in both the northern and southern parts of the Union. Even in 1584 this diversity of products seems to

have existed, for the old account says that the Indians gave to the explorers "divers kinds of fruites, melons, walnuts, cucumbers, gourdes, pease, and divers rootes, and fruites very excellent good, and of their cuntry corne, which is very white, faire, and well tasted."

An Italy and Switzerland in One

In climate and soil the "Tar-Heel" or "Old North State" is like Italy, with a touch of Switzerland in its high mountain ranges. In extent east to west it is the longest state east of the Mississippi; in structure it

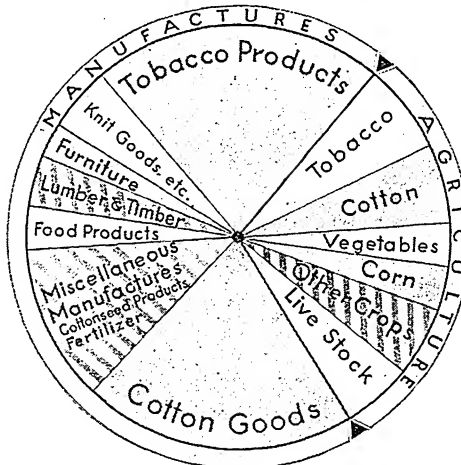
THE DIVERSIFIED FACE OF NORTH CAROLINA



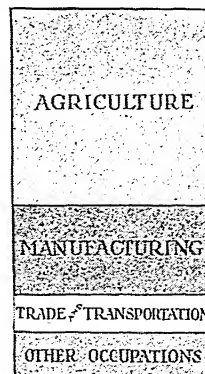
From the reef-fringed coastal plain, the surface of North Carolina rises at the "fall line" to the rolling "up country" as the Piedmont region is here called. From the western end of the plateau region rugged mountain ranges rise abruptly—the largest and highest mountain masses in the eastern United States.

is an incline, sloping from the Smoky Mountains, more than 6,000 feet high, to the level of the Atlantic Ocean, and including in its great length three distinct areas. In the west is a high, cool, picturesque region—a typical resort country, unsurpassed in eastern America for its beauty; a land of springs of pure cold water, of fruits, and of beautiful flowers. As one climbs from the valleys to one of the main peaks one passes successively through the same floral zones that are encountered in traveling from Georgia to southern Canada. The old worn-down mountains are covered with deep rich soil and clothed with massive hardwood forests almost to their tops. Mount Mitchell, with an altitude of 6,684 feet, is the highest peak of the Appalachians, and from its summit seven states can be seen.

This "land of the sky" descends suddenly to the piedmont plateau, several thousand feet below it, where the tumultuous mountains subside into a succession of hills and dales and gently rolling country. This plateau is the great industrial region of the state, and covers one-third of its area. It contains the widest range of agricultural production, and is a growing manufacturing region, especially for textiles, making North Carolina one of the chief cotton spinning and weaving states in the Union. At the "fall line" this "up country" drops abruptly about 200 feet.



Above, the state's products are shown; below, the chief occupations are compared.



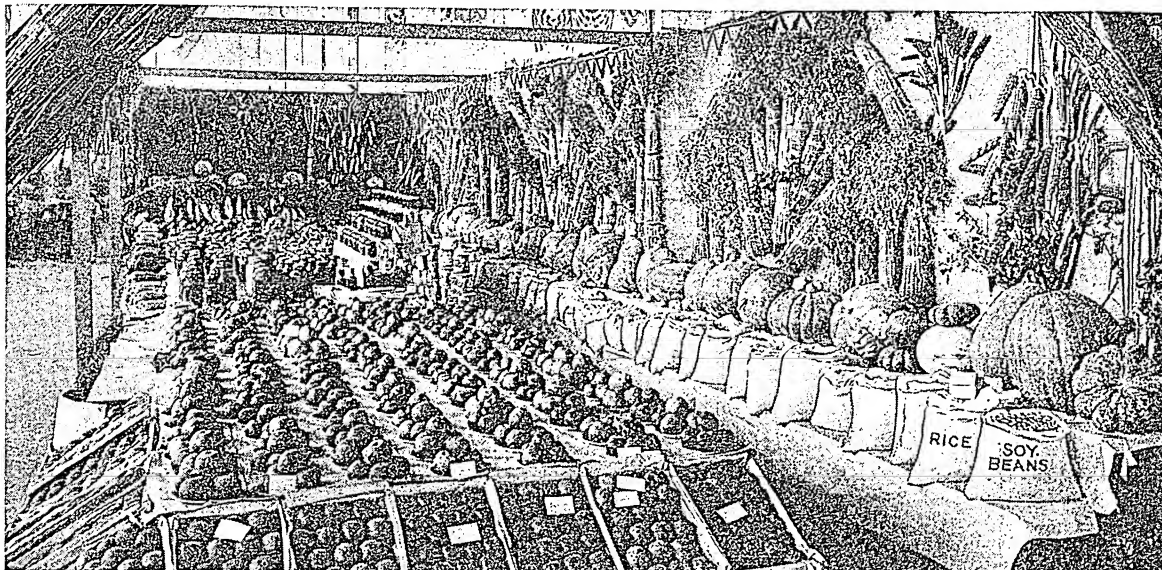
The whole eastern section consists of the coastal plain, an area of low land which comprises over a third of the entire state. This region has recently become one of the great truck-growing regions of the country, shipping hundreds of carloads of early fruits and vegetables to the great markets of the north every year. On the lowlands of the Cape Fear River, rice was formerly an important crop.

North Carolina has two coastlines, an inner coast deeply indented by Albemarle and Pamlico sounds, and an outer line formed by a chain of long narrow sand reefs, from which

project Cape Fear, Cape Lookout, and Cape Hatteras. The last-named is noted for its frequent and dangerous storms, due in part to the meeting of the warm winds from the Gulf Stream with the cooler land breezes. Outlying shoals are very dangerous to navigation and the many shipwrecks which occur here have led to the establishment of two government light-houses to warn mariners from the spot. Shad and herring fisheries on the coast are very valuable and the oysters and other shell fish found are of fine quality.

North Carolina is still a great agricultural state, ranking among the first six states in the value of its crops. Cotton and corn are the great staples, the latter growing everywhere. Some counties are unexcelled by any region in yield of cotton, although the state is on the northern limit of the

PRIZE WINNERS FROM NORTH CAROLINA FARMS.



In this picture you get a fine survey of the agricultural products of North Carolina soil at their best, for these are prize-winning exhibits at one of the state fairs. The soy beans and rice are labeled for you, but can't you recognize most of the others—melons, squashes, grains, and apples and other fruits?

cotton belt. In the production of tobacco North Carolina has taken first place from Kentucky, and it is a large producer of sweet potatoes. Truck farming and grape culture have largely increased



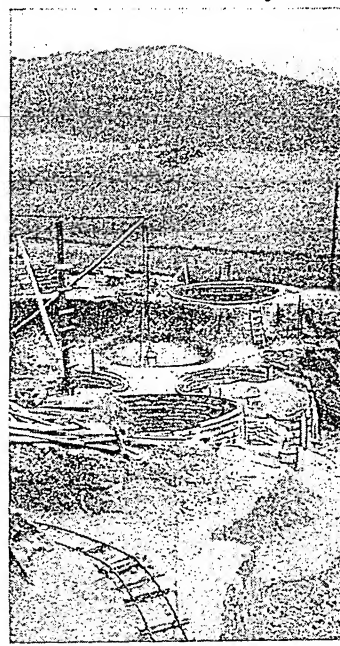
This is the light yellow North Carolina tobacco of which cigarettes are made. It thrives in the loose sandy soil so common in this state.

with recent years.

But North Carolina is not only an agricultural state, although a generation ago it might have been so described. During the past few decades it has experienced such a phenomenal industrial growth that it now ranks among the leading manufacturing states of the South. It has more cotton factories than any other state, and in the value of its cotton products (cotton yarn, hosiery and knit goods, plain cloths, gingham, etc.) it leads

the entire cotton crop of the South. At present North Carolina manufactures practically all the cotton produced within its borders, and ranks high also in cottonseed products. The manufacture of rayon has

become one of the state's chief industries. To its fame as a tobacco grower North Carolina has added a reputation as a manufacturer of tobacco products, produced chiefly in Durham and Winston-Salem, which are known as far as the Ganges and the Nile. The forests which cover much of the state have not only attracted numberless saw mills, but have created large furniture factories, especially at High Point, which has one of the largest outputs of furniture in the Union.

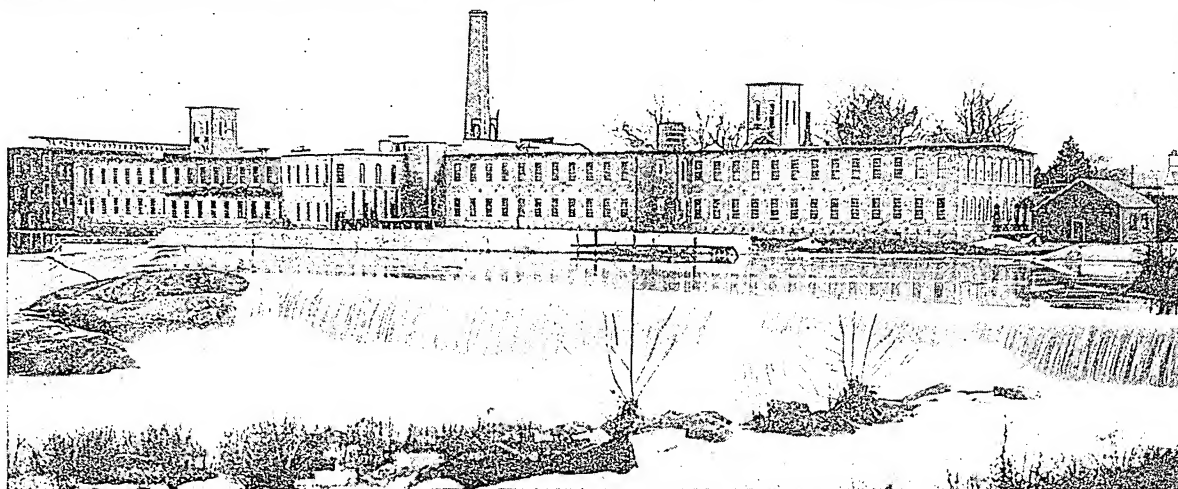


These are settling pits at a kaolin mine. After the clay has been mixed with water to remove the sand, it is put in these pits to settle.

the entire nation. One great factor underlying this tremendous development is the vast water-power created by hundreds of mountain streams and waterfalls, which, it is estimated, could manufacture twice

Immense quantities of turpentine, resin, tar, and pitch are produced from the pine forests—a fact which accounts for the nickname sometimes used for the state, the "Tar-Heel State." The great increase

WHERE THE MOUNTAIN STREAMS COME DOWN TO WORK



Here's one of those big cotton mills that change the products of the cotton fields into white cloth. Not only does North Carolina manufacture all her own cotton, but there is enough water power in her mountain streams and waterfalls to manufacture twice the cotton crop of the entire South!

in manufacturing brought thousands of country people to the factory towns, and provoked many disputes over hours of labor and wages.

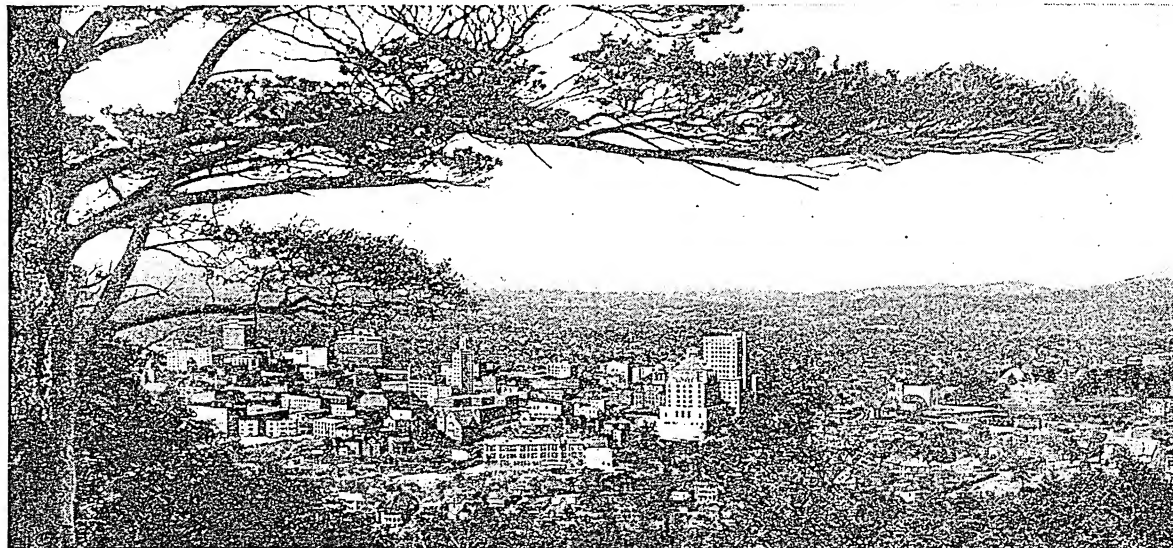
Minerals are found in great variety, but not in important quantities, except the valuable kaolin clay from the western counties, and the granite, limestone, and marble from its many quarries. It shares with New Hampshire the distinction of being the only considerable producer of mica in the United States. Feldspar, coal, gold, silver, and iron are also mined. Before the discovery of gold in California, North Carolina was the leading gold state.

The largest city, Charlotte, is the center of the cotton-mill industry. Winston-Salem has extensive tobacco factories. Wilmington, near the mouth of

the Cape Fear River, is an important commercial city and also a manufacturing center. Raleigh, the capital, popularly called "The City of Oaks," commemorates the name of the state's founder. It has important manufacturing establishments, being in a rich cotton and tobacco district. Chapel Hill, the seat of the University of North Carolina, is 28 miles northwest of Raleigh. Asheville, widely famed as a winter and summer resort, is situated in the heart of the mountain section, surrounded by impressive and charming scenery.

English colonization of the New World began with the expedition sent out by Sir Walter Raleigh in 1584, which explored the Carolina coast between Pamlico and Albemarle sounds. Its favorable report led

ASHEVILLE SITS IN THE LAP OF THE MOUNTAINS



From Beaucatcher Mountain one gazes here across the city of Asheville to the far blue mountains. Besides being a busy industrial city, Asheville is a favored spring and fall resort because of its mild climate.

Raleigh to send out a colony next year, which settled on Roanoke Island; but conflicts with the Indians soon led the settlers to return. In 1587 Raleigh sent out his second colony under John White as governor. Governor White's granddaughter, Virginia Dare (born Aug. 18, 1587) was the first English child born in America. The fate of this "lost colony" is one of the unsolved problems of history; for when Governor White returned to Roanoke, after three years' absence in England to obtain supplies, the settlers had all disappeared, including his daughter and little granddaughter. The word "Croatoan" carved on one of the trees proved a useless clue.

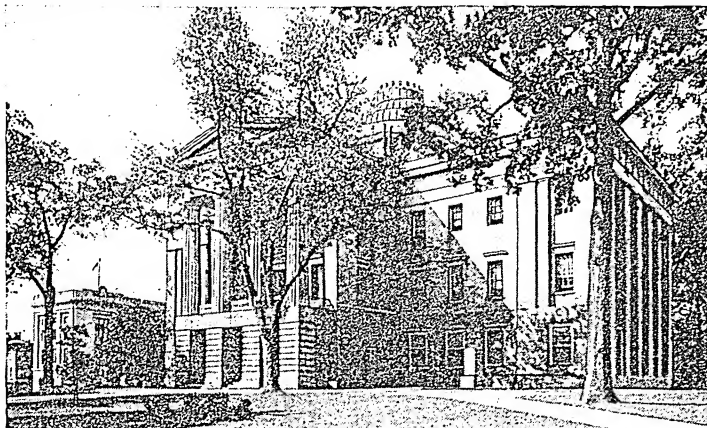
Colonization of the region under a grant from Charles I (in which the name "Carolina," from the king's name, was first used) was no more successful. In 1663 Charles II granted the region to a group of "lords proprietors," who divided it into North and South Carolina, drew up a code of fantastic feudal regulations, and made some progress in settlement. In 1729 North Carolina became a separate royal province. In the first part of the 18th century Scotch-Irish and German settlers began to come into the back country from Pennsylvania (see American Colonies). In 1710, Baron Christopher de Graffenreid established a colony of Swiss emigrants and German Protestant refugees from the Palatinate. He selected a site on the Trent River and called it New Berne. The next year the Tuscarora Indians slaughtered 130 of the pioneers and then swept down with torch and hatchet on the Albemarle Sound settlements. Only after two years of warfare were they driven out.

Sturdy Colonial Stock

Many Highland Scots came to North Carolina following their defeat at the battle of Culloden Moor, in 1746, and neighboring colonies furnished many others of the 300,000 settlers who had spread from the seacoast to the Appalachians before the American Revolution.

North Carolina's colonists were an independent folk. Their resistance nullified the Stamp Act in the territory (see Stamp Act). In 1767, a group of pioneers in the western counties, known as "the Regulators," rebelled against taxes and the methods of officials of the royal government. They were defeated by Governor Tryon in an engagement on the Alamance

THE HOME OF NORTH CAROLINA'S GOVERNMENT



This is the North Carolina State Capitol at Raleigh. It is a substantial granite structure built in colonial style.

Creek, May 16, 1771. Leaders in colonial struggles against the royal governors included George Durant, Thomas Pollock, Edward Moseley, Hugh Waddell, and Cornelius Hartnett.

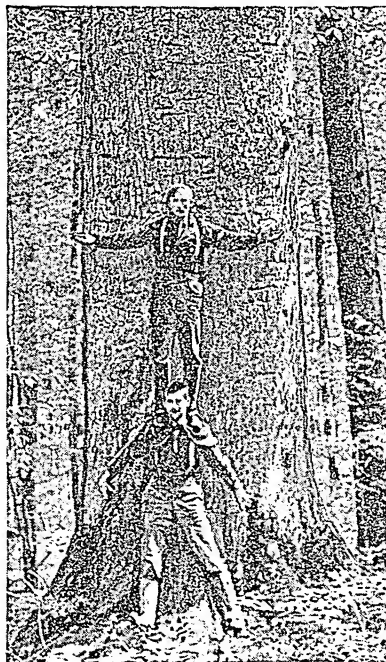
Struggles for Independence

In the face of strong opposition from the royal governor, Josiah Martin, the citizens organized a provincial congress, Aug. 25, 1774, and worked out a temporary government. When news of the Battle of Lexington arrived, in May 1775, some of the militiamen of Mecklenburg County met at Charlotte and passed resolutions repudiating British authority and requesting the people of the county to form a temporary government of their own. These resolutions were adopted on May 31, but many historians believe that a similar series of resolutions was adopted on May 20. The latter has been called "the Mecklenburg Declaration of Independence," and in its honor the state celebrates May 20 as a state holiday.

North Carolina's provincial congress, on April 12, 1776, directed William Hooper, John Penn, and Joseph Hewes, their delegates to the Continental Congress, to vote for independence. It was the first state to take this step. In the meantime, North Carolina's militia had gained a victory over the government troops at Moore's Creek Bridge, Feb. 27, 1776.

Following the adoption of a state constitution, Dec. 18, 1776, Richard Caswell was elected the first governor. During the Revolution, constant fighting between Tories and patriots wracked the state. Cornwallis invaded its bor-

A MIGHTY SPRUCE



These two men doing their circus "stunt" will give you an idea of the size of some of North Carolina's forest giants.

ders in 1780-81 with three armies. The frontiersmen won one of the most signal victories of the war when they defeated a British army on Oct. 7, 1780, at King's Mountain. Cornwallis won the battle of Guilford Court House, March 15, 1781; but his losses there helped force his surrender at Yorktown.

"State of Franklin"

Though North Carolina's delegates were prominent at the federal Constitutional Convention, the state refused to ratify the Constitution until Nov. 22, 1789, six months after Washington's inaugural, when the first ten amendments containing the so-called "bill of rights" had been introduced in Congress. The following year the new state ceded to the Federal government its western section (now the state of Tennessee) which had attempted to form the "State of Franklin" (see Sevier, John). The capital was founded at Raleigh in 1791. In the period before the Civil War three presidents were born in the state—Andrew Jackson, James K. Polk, and Andrew Johnson.

North Carolina did not secede from the Union and join the Confederacy until after the fall of Fort Sumter in 1861. Then it furnished more than its quota of troops to the Confederate forces, and such leaders as Gen. D. H. Hill, Gen. James J. Pettigrew, and Gen. Bryan Grimes. Its port, Wilmington, the center of the blockade running of arms and supplies for the army, was the last port closed by the Federal navy. Its soil saw the last struggles of the Civil War before the surrender of Gen. Joseph E. Johnston to General Sherman at Durham's Station, April 26, 1865. Gov. Zebulon B. Vance took a strong stand for the state's rights against the attempts of the Confederate government to extend its powers. After the blighting era of the "carpetbaggers" the state began the long struggle to retrieve its lost wealth.

The state's greatest progress followed the opening of the 20th century, when Gov. Charles B. Aycock

started his campaign for better educational opportunities for all the people. For 18 years, school construction averaged a building a day. A highway program, threading the state with hard roads, brought consolidated schools with busses to fetch the pupils, as well

as a constant stream of visitors to enjoy the climate and scenery.

The University of North Carolina (opened in 1795), with its wide extension program, heads the state educational system. It has three units—the University proper at Chapel Hill, the Woman's College at Greensboro, and the State College of Agriculture and Engineering at Raleigh. The state also maintains the East Carolina Teachers College, at Greenville; Western Carolina Teachers College, at Cullowhee; and the Appalachian State Teachers College, at Boone.

The Duke Gifts

Duke University, at Durham, is the largest private college in the state and one of the most richly endowed in the country. It was built around the nucleus of Trinity College, through the gifts of James B. Duke, tobacco king and a leader in the development of water power that brought the state's rise in manufacturing. The Duke endowment aids other edu-

cational and welfare projects, and assists with the building and upkeep of hospitals in both North and South Carolina.

Educational qualifications keep down the number of voters in North Carolina. The power of the governor is limited by his lack of a veto and by an advisory council. The state does not use the property tax, but secures the bulk of its finances from income, inheritance, insurance, franchise, utilities, and corporation fees. Interest in the conservation of its mountain beauties has led to the reservation of several national forests and the formation of a vast national park between North Carolina and Tennessee (see Great Smoky Mountains National Park).

IN PROSPEROUS WINSTON-SALEM



The ever-growing prosperity of North Carolina is reflected by this office building in the city of Winston-Salem.

The WHEAT-CLAD PLAINS of NORTH DAKOTA



North Dakota's Crop of Spring Wheat is by far the Largest in the United States

NORTH DAKOTA. As large as New York, Massachusetts, Connecticut, and New Jersey put together, but with a population less than that of Brooklyn—a big land of vast open plains and fertile prairies, yielding abundantly, but with resources not yet fully developed—North Dakota

is a forward looking state with brilliant prospects for further growth and progress.

Lying partly in the Prairie Plains region, and partly in the Great Plains, North Dakota consists of three vast terraces rising one beyond the other, from east to west. The most eastern and the lowest of these is the famous Red River valley, which begins in Minnesota, extends through North Dakota, and as far north as Lake Winnipeg in Canada. To the west of this is a slightly higher plain, which however contains one group of hills, the Turtle Mountains in the north. This plain reaches to the Coteau du Missouri, a great ridge or escarpment extending diagonally from northwest to south parallel to the Missouri River. Beyond this is the third terrace, a plateau rising to a height of more than 3,000 feet in the southwest, and occupying about half the state.

The monotony of the treeless prairies that cover the greater part of the state is broken by many rivers and small lakes. The large salt lake, called Devils Lake, is a favorite vacation spot. Its irregular

Extent.—East to west, 343 miles; north to south, 214 miles. Area, 70,665 square miles. Population (1940 census), 641,935.

Natural Features.—Pembina Mountains (low wooded hills in the northeast); Turtle Mountains (highest point, 2,400 feet) in north central part; Coteau du Missouri, separating southwestern plateau half of the state from the eastern plains; numerous buttes (Black Butte, 3,468 feet) and "bad lands" in west. Rivers and lakes: Red River (forming eastern boundary) and its tributaries, the Pembina, Goose, and Sheyenne; the James; the Souris; the Missouri and its tributaries, the Little Missouri, Cannonball, Heart, and Knife; Devils Lake and numerous small lakes. Mean annual temperature, 39°; mean annual precipitation, 17".

Products.—Wheat, oats, barley, rye, hay, potatoes, flaxseed; cattle, horses, wool, dairy products; coal, clay products, lignite.

Cities.—Fargo (32,580), Grand Forks (20,228), Minot (16,577), Bismarck (capital, 15,496), Jamestown (8,790), Mandan (6,685), Devils Lake (6,204), Valley City (5,917), Dickinson (5,839), Williston (5,790).

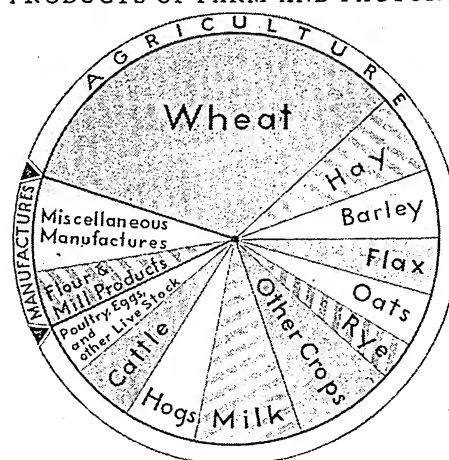
banks are clothed with trees, and its briny waters, which resemble the ocean in both appearance and taste, make possible the unexpected delight of "sea-bathing" in this far inland region.

Still more unusual is the scenery in the unglaciated southwestern part of the state—the

so-called Bad Lands. Here the rains and winds of centuries have carved the sandstone into grotesque peaks and oddly shaped pinnacles, and to make them still more fantastic, fires sweeping over the extensive

beds of lignite coal have burned and baked and melted the surface soil and helped to give it the weird colors which we see—blues, reds, browns, yellows, purples, and grays. Seen against the bright blue of a clear Dakota sky, these fantastic buttes present a strangely beautiful picture. Here one finds wonderful "paint rocks" of various colors, which need only the addition of water for use. The early pioneers called this region the Bad Lands because it was so difficult to traverse. In other respects it hardly deserves the name, for even here the valleys are fertile, and cattle graze peacefully at the foot of these strange rock formations. To compensate the

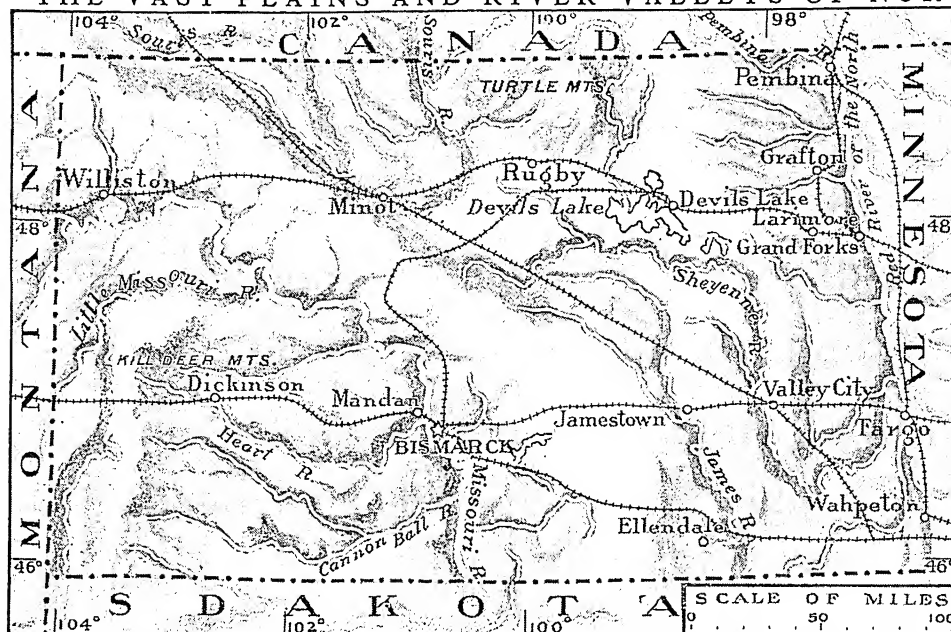
PRODUCTS OF FARM AND FACTORY



Wheat occupies two-thirds of the acreage devoted to cereals, and represents one-half of the value of all cereals combined, as well as nearly one-third of the value of all farm products.

farmer for any difficulty he may have, he is able to dig from the hillsides his own fuel in the shape of lignite or brown coal. This may be mined almost from day to day as he needs it.

THE VAST PLAINS AND RIVER VALLEYS OF NORTH DAKOTA



AGRICULTURE

MANUFACTURING

TRADE AND
TRANSPORTATION

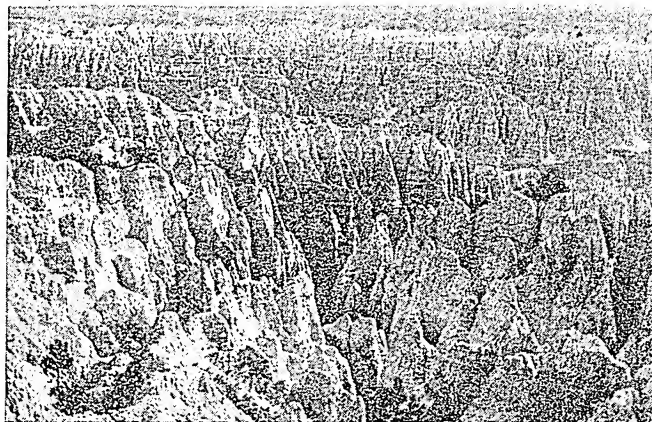
OTHER
OCCUPATIONS

The prairies of North Dakota have become one of the most famous wheat growing regions of the world. Almost any part of the state can be made to yield abundantly by simply turning over the rich loam.

About 32,000 square miles in the western part of the state are underlaid with this half-made coal, which was once considered of little worth, but which is now revealing greater and greater possibilities of usefulness as a source of heat and power. By proper

the soils are rich fine-textured loams, with all the mineral elements necessary to plant life and a large capacity for storing moisture. Nearly all of the rainfall occurs during the growing months of May, June, and July. The summers are mild and delight-

"BAD LANDS" THAT AREN'T SO BAD AFTER ALL!



In the southwestern portion of North Dakota are picturesque regions like this, where the soil has been carved deep by the winds and waters of ages. Although they are called the "Bad Lands," the valleys of this region are extremely fertile and the smoother ranges provide excellent grass and winter shelter for cattle.

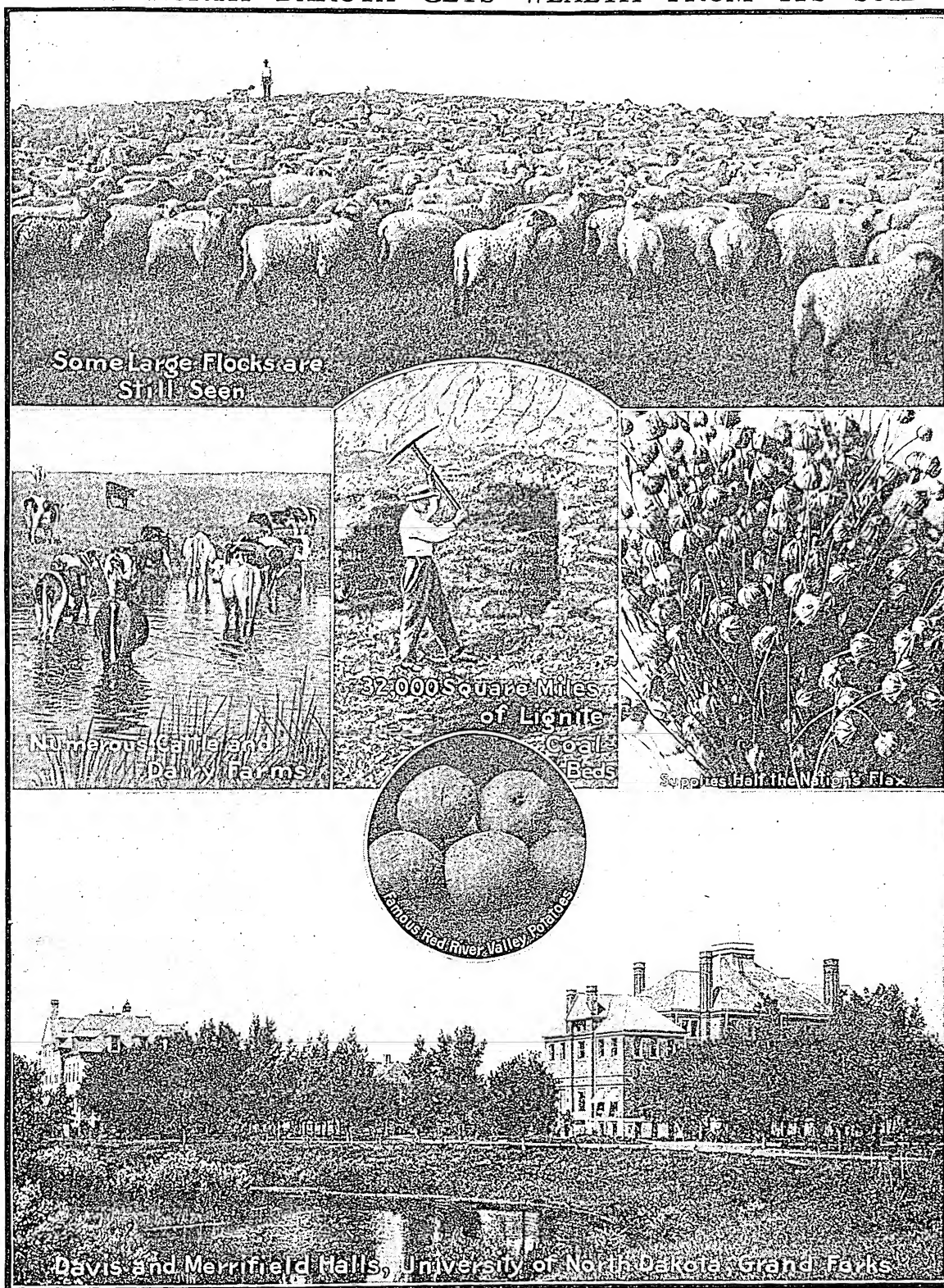
Moreover, few states in the Union have a larger percentage of tillable land than North Dakota. The black loam which has made possible the great wheat fields of the Red River valley and has caused this region to be known as "the bread-basket of the world" is the richest of all; but there is scarcely any portion of the state that cannot be cultivated by merely turning the ground with the plow. Most of

ful, and ideal for growing crops. The winters, however, are cold, the thermometer often going down to 40 degrees below zero, and sometimes lower. But the cold is not felt as it would be in a damper atmosphere; the dry clear air makes it healthful and invigorating.

The great crop of North Dakota is wheat. The quality is very high, and as many as 100 million bushels are produced in a single year. In the production of spring wheat, which is the variety best adapted

to climatic conditions, North Dakota leads all the states in the Union. The wheat is sown during the month of April and requires no further attention until harvest. Winter rye, in which this state also ranks first, though the crop is not so valuable, is often planted on the same land as soon as the wheat is harvested. Oats rank next to wheat in the number of bushels produced, and about half

HOW NORTH DAKOTA GETS WEALTH FROM ITS SOIL



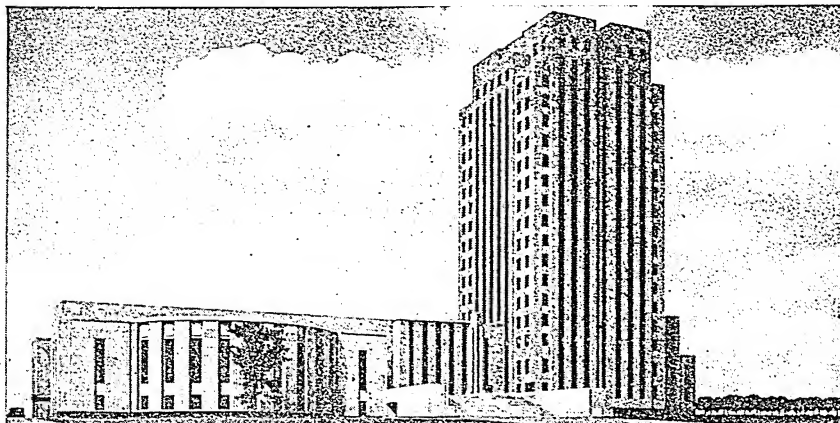
North Dakota is practically one great plain—and from this plain the enterprising inhabitants of the state bring a wealth of products to feed the nation. North Dakota's wheat, of course, is world-famous; and the state furnishes great quantities of flax, and a fine grade of potatoes, as well as dairy products and general farm produce. The state has valuable lignite coal beds, while the unplowed prairies support sheep and cattle.

the flax grown in the country is produced in North Dakota. Barley, corn, hay, and potatoes are very important crops, and when planted in rotation with wheat help to keep the soil from becoming depleted.

There was a time when great cattle and sheep ranches covered a large part of the state. Now most of these have been cut up into farms; but the abundance of nutritious natural grasses, and the ease with

owned terminal elevators and flour mills were established to secure fairer treatment for the farmer, together with coöperative stores, hail insurance, a system of rural credits, and a state bank in which all public funds of the state must be deposited. Improvements on farm land were exempted from taxation, and unused lands were heavily taxed to force them into productive use. These are some of

NORTH DAKOTA'S MODERN CAPITOL



In the modern North Dakota Capitol, with its 240-foot tower, the branches of the government are provided with separate quarters; the administrative departments occupy the tower section and the legislative chambers are in the unit to the left.

which alfalfa and other feeds can be grown, still make North Dakota a big stock-raising state. Dairying is also an important industry.

People and Government

Farm conditions are of chief importance to the prosperity of a state in which 80 per cent of the people live on farms or in small villages, and one-third of the urban population are engaged in processing agricultural products. Flour mills, meat-packing plants, and creameries are established near the areas they serve. Fargo, on the Red River, is the largest city and the principal distributing point. Grand Forks, the second city, north of Fargo, has the largest grain terminal facilities between Spokane and Minneapolis. It is a railroad division point. Minot, on the Souris River, is the metropolis of the north central and western part of the state. Bismarck, the capital, on the Missouri River, is a shipping point for the south central part of the state.

Resentment at practices prevailing in the grain trade led the farmers in 1915 to organize the Non-partisan League. The League's success in getting control of the state government and the legislation it put through in behalf of the farmers—"progressive" or "radical" according to one's point of view—attracted the attention of the whole country. Although the program of the League aroused much criticism from opponents, its influence spread widely.

A first step in realizing its economic program was the passing of an amendment to the state constitution so as to permit the state to engage in any kind of business in the interest of its citizens. Then state-

the most outstanding features of an economic program which, in many respects, is the most far-reaching adopted by any American state. North Dakota also has a mother's pension law, and its exacting pure food and drug acts were made effective under the leadership of Dr. Edwin F. Ladd, president of North Dakota Agricultural College and United States senator.

The state constitution allows the initiative, referendum, and recall. The governor may not veto any legislation initiated by or referred to the voters.

Since North Dakota is so largely a rural state, great pride has been taken in making the rural schools efficient. In most parts of the state there are consolidated schools, to which the students ride free. They enjoy the same advantages as do children in the city schools. The state ranks low in its percentage of illiteracy; only 1.5 per cent of the people are unable to read and write. About 60 per cent are foreign born, or of foreign parentage; Norwegians, Russians, Germans, Canadians, Swedes, and Danes lead in numbers. Settlements of Finns and Icelanders were drawn there by the northern latitude. Vilhjalmur Stefansson's family came from Iceland; and Lieut. Carl Ben Eielson, martyr to the cause of Arctic aviation, was a North Dakotan of Norwegian descent.

Schools and Colleges

Among institutions of higher learning in the state are the University of North Dakota located at Grand Forks; the North Dakota Agricultural College at Fargo; the North Dakota School of Forestry at Bottineau; the North Dakota School of Science at Wahpeton, which offers industrial training; the teachers colleges at Valley City, Mayville, Minot, and Dickinson; and the State Normal and Industrial School at Ellendale. Jamestown College at Jamestown and Wesley College at Grand Forks are private institutions.

North Dakota had its farmers even before the coming of white settlers, for the Mandan, Hidatsa, and Arikara tribes along the Missouri River had a settled agricultural mode of living in Indian days. The wandering Dakotahs, or Sioux, the Chippewas, and the

Assiniboines, however, raised only a few small crops. They spent their time chiefly in hunting.

Valuable furs collected by Indian hunters brought the first white men to the Dakotas. Canadian and American fur companies contested bitterly for the valuable pelts found there. La Vérendrye, a Frenchman, and his sons made three trips into North Dakota in 1731, 1738, and 1742, in their effort to find a water route to the Pacific, and they paid their expenses by fur trading. They set up trading posts, and other eager traders followed. The first map of the area was made by David Thompson about 1798 for the Hudson's Bay Company. Pembina, in the northeast, became a leading trading post after its establishment in 1801 by Alexander Henry, Jr., an agent for the Northwest Fur Company. (See Furs and Fur Trade.)

Explorers and Colonists

Following the Louisiana Purchase by the United States, Lewis and Clark made their way up the Missouri, and camped in a Mandan village during the winter of 1804-5. They found there the Indian woman, Sacajawea, who guided them westward (see Lewis and Clark Expedition). About 1818, a party of Scottish colonists from Lord Selkirk's settlement in Manitoba came to Pembina, where they set up a fort and increased the fur trade. Scientists came to study the natural wonders of the new country—John Bradbury and Henry M. Breckenridge in 1811, Prince Maximilian and Carl Bodmer in 1832, and John James Audubon, the great American naturalist and artist, in 1843.

Finally the wilderness was left to the fur hunters no longer; ranchers and farmers entered and began to build homes. Steamboats, plying up and down the Red River and the Missouri, replaced the old oxcart. The government set up military posts to protect travelers and inhabitants from the Sioux, who were making a last fight for their rich hunting grounds.

From Fort Abraham Lincoln, on the Missouri, Gen. Alfred H. Terry, Col. George A. Custer, and Maj. Marcus A. Reno set out on May 17, 1876, to crush the Sioux uprising under Sitting Bull, Crazy Horse, and Gall. Custer and his men were slaughtered at the battle of Little Big Horn and Major Reno's battalion, besieged on a cliff, was saved from the same fate only by the approach of General Terry's force (see Custer). Capt. Grant Marsh, one of the hardy pioneer steamboat pilots, carried Major Reno's many wounded back to the fort on his steamer.

Railroads Bring Settlers

When the railroads reached North Dakota, settlers thronged into this rich wheat land. The Northern

Pacific crossed the Red River at Fargo in 1871, and James J. Hill's Great Northern reached Wahpeton that same year. These rival railways pushed their steel across the state, vying with each other for settlers who would ship great grain crops back east. The roads advertised far and wide in Europe and America the free lands offered by the government under the Homestead Act (see Lands, Public). Rail-

WHERE RUNNING WATER BUILT A PYRAMID



Rugged buttes stud the Missouri Plateau of western North Dakota where the waters of myriad streams have cut away the soft sandstone, leaving the harder rock in many fantastic shapes.

roads sold at a low rate the vast acres which the government had given them beside their rights-of-way. Sod houses dotted the prairies, as land-hungry folk from many nations sought a better chance in this open country. Oliver Dalrymple and other capitalists secured great tracts of land in exchange for the stock of the Northern Pacific when it failed, or purchased it from homesteaders. These "bonanza" farms were cultivated by the newly invented agricultural machinery, and often made large profits. Speculation drove land values sky-high.

West of the Missouri vast ranches numbered their herds by the thousand. In the early 80's, the Marquis de Mores with 8,000 acres built the town of Medora and organized the state's first packing plant. Theodore Roosevelt arrived in search of health and adventure in buffalo hunting, and bought two ranches, which he managed between 1883 and 1888. Irrigation and dry farming have since replaced some ranches with farms.

North Dakota became a state in 1889, when the territory of Dakota was divided and admitted into the Union as North and South Dakota. Before that it had been included in many territories. The eastern part, drained by the Red River, was claimed by Canada until the treaty of 1818 placed the boundary at the 49th parallel of latitude. Then it became a part of Missouri Territory. Later divisions placed it within Michigan, Wisconsin, Iowa, and Minnesota territories, before Dakota Territory was formed in 1861. This territory, which included North and South Dakota, took its name from the Indian name "Dakotahs" (meaning allies) for the Sioux Confederation whose members once roamed these plains.

The FIERCE VIKINGS Who Terrorized All EUROPE

NORTHMEN. In their long, shallow, black boats, the sides hung with round shields, yellow and black, with striped sails and with high-curved prows carved in the form of a snake or dragon, the bold Vikings of the north once scoured the sea for adventure, plunder, commerce, and conquest.

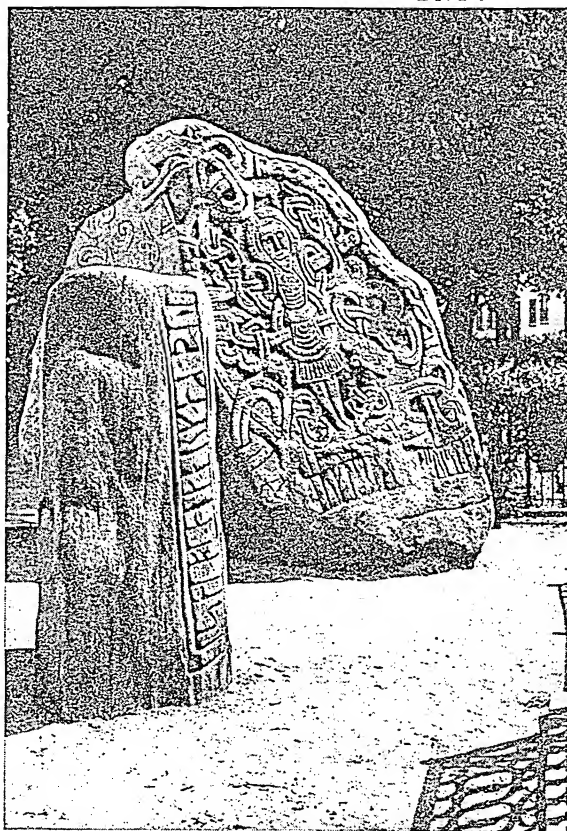
The Northermen, whom we commonly call Vikings, were the ancestors of the modern Swedes, Norwegians, and Danes. The long coast line and many fiords of the Scandinavian peninsula on which they dwelt made it natural for them to become sailors. They took to the sea both to catch fish and to make long trading and raiding expeditions to the lands of their richer and more highly civilized neighbors to the south, east, and west. For nearly three centuries—the 9th, 10th, and 11th—their stout boats, driven by sails and oars, ravaged the coasts of Europe from the British Isles and France in the north to Italy in the south. They even rowed up the rivers into the heart of France and Germany. Their invasions were the last wave of the Teutonic conquests which began with the Goths and the Vandals five centuries earlier and overran all Europe.

Wherever they went they spread destruction and terror. So feared were their raids that a special prayer was offered in the churches against them: "From the fury of the Northmen, good Lord, deliver us."

How these Viking chieftains must have loved their roving life on the stormy sea! They even chose their beloved ships as their tombs. Sometimes they were cast adrift, on "the pathway of the swan," but at other times, the ship was buried in a "barrow" or long grave mound. At Gokstad in southern Norway, a Viking ship has been found with the body of its chieftain, and around him his horses, his dogs, and even a peacock. Only the weapons remained of the treasure horde that had been placed in the ship. Arabian coins of the 9th and 10th centuries, coins from England and Ger-

many, weapons and gold ornaments, saddles and silks from oriental countries, have been found in the barrows around Birka and Visby in Sweden, telling us of the Northmen's ways of living and their journeyings to foreign lands.

RUNIC STONE MONUMENTS



Such runic stones as these at Jelling in Jutland, Denmark, were carved by Viking craftsmen about the 10th century. They were monuments to the dead, and were placed in graveyards. Note the elaborate conventional design around the figure.

Runic stones with pictures and runic writing also have preserved for us descriptions of the life and wanderings of the Vikings. One such stone in Sweden tells how Sirid raised it to her husband Sven, who "often sailed with costly ships to Sengallen (Russia)." Five different runic stones remain to tell us that Jarlabanki, a rich farmer, owned the whole of Täby, a parish still existing in Sweden. One Viking left the story of his life in an inscription on a marble lion at Athens, which now stands in Venice. In this Norse runic language, the alphabet had only 16 letters; it was much like the early Gothic of the primitive Germanic tribes.

Skalds, or minstrels, sang of the exploits of Viking chieftains and kings during the long winter evenings before the guests and retainers of the chieftains. Sagas based on the songs of the skalds were

written in the 12th and 13th centuries, thus keeping for us more knowledge of Viking life. The Eddas tell the stories of the gods of the Northland. (See *Odin*; *Scandinavia*; *Thor*.)

From Egil of Iceland's Saga, we learn that the Vikings were merchants as well as pirates:

Thorolf had a large sea-going ship . . . it had a sail with blue and red stripes. . . . This he made ready and ordered his men-servants to go with it; he had put on board dried fish, skins, tallow, gray fur and other fur which he had from the mountains; all this was of much value. He sent it westward to England to buy cloth (woolen) and other goods he needed. They went southward along the coast, and then out to sea; when they arrived in England, they found a good market, loaded the ship with wheat and honey, wine and cloth, and returned in the autumn with fair winds.

At the beginning of the Viking period, about 850, a number of walled trading towns were already flourishing: Uppsala,

f u t h o r k h a i n s t d p b m l r (y)

The 16 letters of the runic alphabet appear here with their English equivalents. Note how the letters are adapted for carving.

THE NORTHMAN WHO FOUNDED THE RUSSIAN EMPIRE



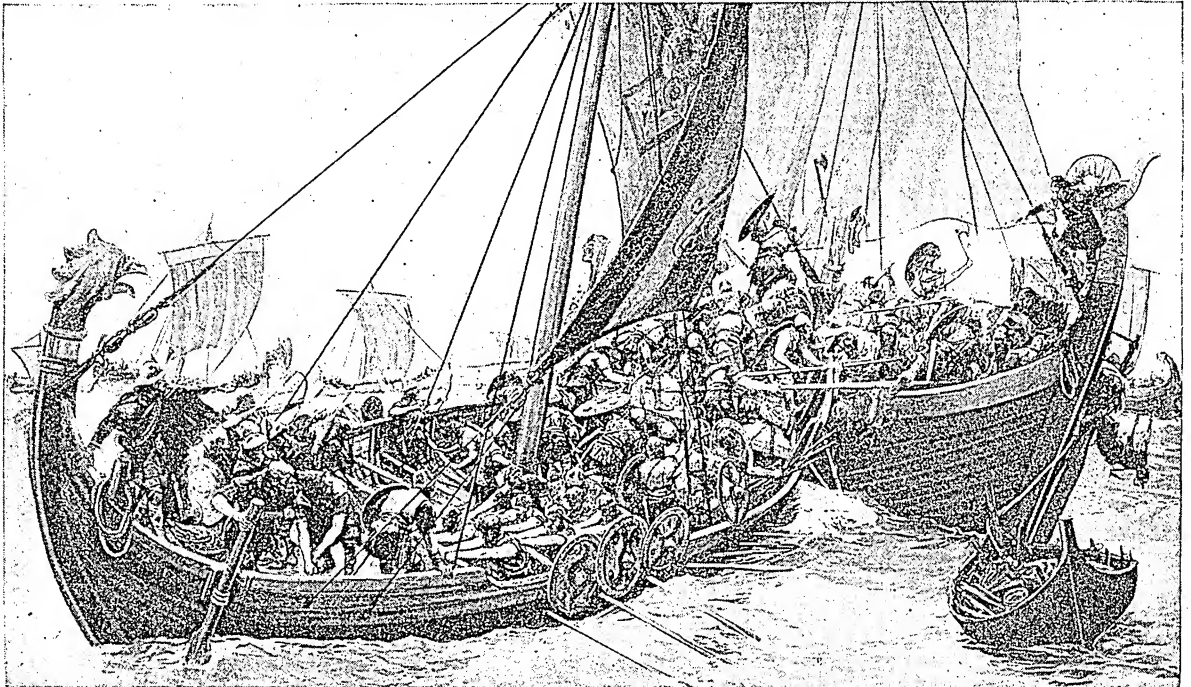
When the Russian tribes of the 9th century found themselves involved in constant quarrels, tradition says that they called upon the Northmen to restore order. In response came Rurik the Oarsman, and his two brothers, Sineus and Truvor—all bold sea-rovers. They put an end to Russian disputes by conquering the land from the Gulf of Finland to the Volga, establishing their capital at Novgorod. After Rurik's death in 879, his descendants held princely sway in Russia until the end of the 16th century.

Birka, and Sigtuna in Sweden; Visby on the island of Gotland; Skiringssal in Norway; Schleswig or Hedeby in Jutland; and Dorstadt in Friesland.

Their oaken boats swarmed in the many harbors or *vik*, giving them the name of *Vikings*, people of the harbors. Their greatest joy was to plow the stormy waves in search of new lands, from which they could take booty and tribute (*danegeld*). Their religion

given to the district, and the Northmen who lived there were called Normans. The Normans adopted the language of the French and gave up their heathen beliefs for the Christian religion. Under the stern rule of Duke Rolf and his successors they soon became quiet industrious tillers of the soil. It is said that before Rolf died, "gold rings could be hung from the trees and no one would touch them." Between 872

WHEN THE NORTHMEN WENT TO WAR



In their long, shallow, black boats with high curved prows shaped into snakes and dragons, the bold Vikings of the north scoured the known and unknown seas in search of adventure, conquest, and booty. At times, also, they fell out among themselves, as in the scene pictured here. War was one of the delights of life to the Northman. The only thing he dreaded was that he might die at home of some peaceful sickness instead of in the excitement of battle.

taught them that only in a violent death could a warrior hope to ride to Valhalla on the horse of a Valkyrie.

As early as 700 A.D. colonies of Norse and Danes were migrating to the Orkneys, the Shetlands, the Hebrides, and the more distant Faroes. About 800, Danes established trading posts which became the first cities in Ireland, and 50 years later Olaf the White of Norway contested their monopoly. From the islands came raids on the Scottish and English coasts.

After Alfred the Great defeated the Danes, many settled in East Anglia and Northumbria and for a time ruled a large territory called the Danelaw (see Alfred the Great; Canute; England; William I, the Conqueror). Three times Paris fell before the invaders, and was only saved the fourth time after a siege of 13 months by the courage of brave Count Odo. At last in 911 Charles the Simple, king of France, concluded a peace with Rolf (or Rollo), the leader of the Northmen. By it the Northmen were allowed to settle in a rich section of northern France on both sides of the mouth of the river Seine, and Rolf became a vassal of the French king. The name Normandy was

and 930, many freedom-loving jarls left Norway for Iceland rather than bow to the yoke of King Harald Haarfagre ("Fair Hair").

In 984 or later, Eric the Red established a colony in Greenland. About the year 1000, according to Norse sagas, his son Leif Ericson sailed to the coast of North America and gave the name Vinland to the place he discovered (see America). A few years later, the story runs, Thorfinn Karlsefni, with three ships and 160 men and some women, tried to colonize Vinland. One ship deserted soon after its arrival; some of the colonists who remained were killed by Indians, and the rest, after three winters, sailed for home.

Shortly before the settling of Iceland, Rurik, with his oarsmen (*rusmen*) came from Sweden to settle along the Dnieper River, and gave the country the name "Russia." Kiev and Novgorod became centers of oriental trade. The kingdom lasted seven centuries.

Christianity everywhere prevailed over the heathen gods by 1050, and the Vikings, as Norman knights, became crusaders. Under Robert Guiscard, they formed the kingdom of the Two Sicilies.

Just when the Scandinavian peninsula became populated we do not know, but graves of people living in a stone age and in a bronze age prove that civilizations much earlier than the Viking had existed there. First cousins of the Anglo-Saxons, who came from the region just south of the Jutland peninsula, the Scandinavians belong to the Low German tribes.

Forests covered the homeland of the Vikings. Along the many rivers and lakes, off the coast, and on the shores of the fiords were clearings burnt in the timber where strips of barley, rye, oats, and wheat waved in the breeze. In the center of the tiny fields stood the village of ten to fifteen houses. Around the houses were barns, granaries, separate kitchens, and spinning houses, for wood was plentiful, and the Vikings were builders. Just beyond the village was the common meadow which furnished hay for the winter. On the slopes of the neighboring mountains were meadows where the dairymaids herded the cows in the summer and made butter and cheese. Horses grazed in these meadows; swine grew fat on the acorns of the forest.

Some of these farms and villages have continued in the same family down to the present day. Family pride demanded that land should never go out of the family; it usually descended to the oldest son, and the other sons had to seek their fortunes elsewhere.

In the Edda song 'Rígsthula' we find a description of a freeholder during the Viking age. When Heimdal came to visit him, he was cutting a loom-beam; his beard was trimmed, his hair lay on his forehead, and he wore a tight shirt. There was a treasure chest on the floor. His wife twirled a distaff; she wore a head-dress, a smock, a kerchief around her neck, and pin-brooches on her shoulders. She called her child Karl (meaning man), and wrapped him in linen. When he grew up, he broke oxen, made plows, timbered houses, made barns and carts, and drove the plow. His parents selected his bride, and drove home with "the maiden with the hanging keys and with the goatskin kirtle (coat)." Viking women always carried a bunch of keys, a symbol of their rule over the house.

Slaves, called *thralls*, were captured in battle or bought at slave markets. Most freemen had several thralls, and rich jarls and chieftains had many.

A Visit to a Wealthy Jarl

The jarls, or "king's men," were warriors or retainers, gathered around the chieftains of the tribes. As reward for special service in battle, they were given land and became wealthy.

In the story 'Rígsthula', mentioned before, Heimdal found Jarl twisting strings of bent elm, and shafting arrows. His wife wore a head-dress, a brooch on her breast, and a long trailing gown of blue. Jarl's hair was fair, his cheeks bright, and his eyes as keen as a snake's. He ruled over 18 farms and gave to all treasures and rings (used as money).

But the jarls stood no higher than the karls in the village councils, nor was there much difference between them when it came to farming; for even the kings personally managed their fields. Thus in 1014

we find King Sigurd Syr of Ringerike in Norway out in the fields, when his famous stepson, Olaf Haraldson (St. Olaf), arrived on an unexpected visit. King Sigurd had "a blue kirtle (blouse-like coat) and blue hose, high boots bound about the legs, a gray cloak and a gray hat, a shade about the face, and in his hand a staff, which had at the top a silver knob overlaid with gold, and in it a ring of silver."

In honor to his noted stepson, King Sigurd put on his best clothes. He had "his boots taken off, and set on his feet hose of cordwain (fine leather), and bound upon them gilded spurs; then he took off his cloak and kirtle, and clad him in gala clothes, and overall a scarlet cloak, and girt about him a decorated sword, and set upon his head a gilded helmet and mounted his horse, which had a gilded saddle and a bridle all-gilded and set with melted stones (enamel)."

Simple Fare for Sturdy People

Meals were simple even in the homes of chieftains. King Sigurd gave his guests fish and milk every other day, and alternated it with meat and ale. Mead, an intoxicating drink made of honey, was served on festival occasions. All ate with their fingers, and cut their food with the hunting knives that hung at their belts. Before and after meals, the women passed basins of water and linen towels. Spoons of wood, horn, or bone were common, and sometimes of silver. It was customary for the daughters of the house to pass the drinking-horns of ale or mead.

The houses of poor and rich alike were built of logs and differed only in size. A long room with a high-pitched roof was the most important part of the house. In the middle of the hard-beaten clay floor was the open fire, and above it, a hole in the roof to let out the smoke. Windows were cut in the roof and covered with thin transparent skin. Turf, thatch, or shingles covered the roof.

Shields, weapons, and tapestries woven by the women of the household adorned the walls. A place of honor was reserved for the father of the home on the "high-seat" in the middle of one of the long walls, between the benches that lined them. In front of the "high-seat" stood the two "high-seat posts," dedicated to the gods. At night, the benches were used for beds. In the better homes beds were built into the walls and covered with rugs and cushions of down. At meals, long narrow tables were set before the benches.

The village council or *thing*, composed of the freemen, decided the village law or *byalag*. Called together at the "thing" in the *herad* (hundred), the freemen decided on criminal cases or disputes. If anyone committed murder, he had to pay *wergeld* to the family of the murdered man or be outlawed. Gradually assemblies were developed for all the Scandinavian kingdoms. The Norwegian parliament is still called the Storting. In Sweden, the county councils are named Landsting.

Contributions to Civilization

What contributions did the Northmen make to European civilization? First, their merchant vessels

and trading towns stimulated commerce between all the regions of Europe which they touched, and helped break down the isolation of the early Middle Ages. Second, they gave England and France their first fleets, and introduced armor better than any that had been known before. Third, their adventurous and seafaring tendencies quickened the life of the rest of Europe. Fourth, with their genius for government, they influenced the governmental teachings of England and other countries, and they established the first government of Russia. The thousand-year-old parliament of Iceland, the Althing (930) is the oldest existing parliament in the world; and the Isle of Man has a parliament of Norse origin almost as old.

NORTH SEA. Upon entering the English Channel even the sturdiest passenger on the largest liner—though he may have crossed the whole Atlantic without a qualm—usually prefers to keep close to his cabin or his steamer chair; for the North Sea, of which the English Channel is the southern arm, is one of the roughest in the world.

Shallow seas are likely to be rough. The average depth of the southern portion is only about 100 feet; toward the middle it reaches 250 feet, and in the north, 400. In places it is shallower still. Indeed we should have to go back only a few thousand years to find this region dry land; for it was comparatively in late geological times that this sea was formed when the Atlantic first swept over the plains which had formerly joined the British Isles to the mainland.

The Dogger Bank, a great sandbank 170 miles long by 60 wide in the center of the sea between England and Norway, is only 50 to 100 feet under water. The only really deep places are to the north, in the Norway Deep, which sheers off to 1,000 feet 20 miles from shore, and to over 2,400 feet at the entrance to the Skagerrak. This arm, the most notable of the many fiord, bay, and estuary formations that indent the shores of the North Sea, separates Norway from Denmark and connects through the Kattegat with the Baltic Sea.

You could lose 180 North Seas and more in the Atlantic Ocean, for its area is only a little over 190,000 square miles, not much more than that of the Caspian Sea. Its greatest length from the Shetlands and the southern coast of Norway to the Strait of Dover is only 600 miles, its greatest width, between Haddingtonshire (in Scotland) and Denmark, is 420 miles, and the distance from Calais to Dover is only 21 miles. Yet this little sea has been the theater of more battles and shipwrecks than almost any other sea in the world. Its navigation has always been treacherous, and even in our own day, when every shoal, sandbank, and submerged rock is known, shipwrecks are not infrequent. At the southwest angle there is a great junction of traffic where the mouths of the Thames, Scheldt, Meuse, and Rhine converge; and all the way from Calais to Oslo are the harbors and river ports of England, France, Belgium, Germany, Holland, Denmark, and Norway.

Fishermen as well as vessels of commerce brave the wild waves and the turbulent winds of the North Sea, for here lie some of the richest fishing grounds in the whole world. The shallow waters are full of the lower forms of animal and vegetable life that attract fish. The bays abound in oysters, crabs, lobsters, shrimps, small fish, and mussels, while from the open waters the fishermen draw in nets or on lines salmon, turbot, plaice, sole, cod, mackerel, herring, halibut, and haddock. Whales, dolphins, porpoises, seals, and sharks also wander into the North Sea waters.

The North Sea was the chief theater of naval operations during the World War of 1914-1918, and during most of the European war that began in 1939. Hundreds of thousands of mines were laid by both sides, and these and submarines took a heavy toll of both merchant and naval shipping. (See Europe; World War of 1914-1918.)

NORTHWEST TERRITORIES, CANADA. About one-third of all Canada is comprised in the huge wilderness known as the Northwest Territories. This consists of a plain stretching north from the prairie provinces to the Arctic Ocean, and continued by the great group of islands, the northernmost of which extends to within 475 miles of the North Pole.

The entire population is only 9,723 (1931 census), mostly Indians, half-breeds, and Eskimos. A few white people live near the mines and at the trading posts of the Hudson's Bay Company (see Hudson's Bay Company). In recent years, mining has come to rival the fur trade as the most important industry. The mine at Great Bear Lake is one of the world's chief sources of radium and uranium. Silver, gold, and petroleum are also being exploited. Most of the area is still unexplored, and must remain forever uninhabitable for white men because of the severity of the climate. About half is comprised in the great plain known as the Barren Lands. In the west, along the valley of the Mackenzie River, the soil is fertile and the climate somewhat more moderate, so that vegetables and hardy cereals are raised at the trading posts.

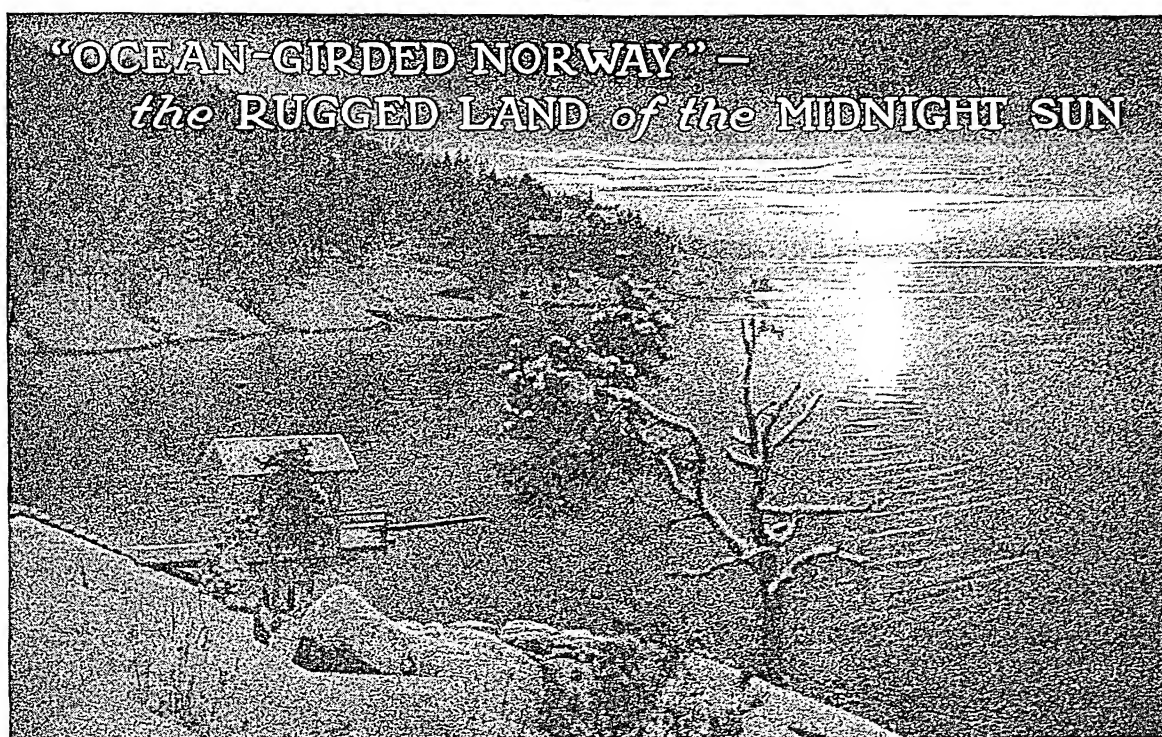
Until 1869 all the region was part of the immense possessions of the Hudson's Bay Company. It is administered by a commissioner appointed by the government of Canada and by the Royal Canadian Mounted Police, and is divided into the provisional districts of Mackenzie, Keewatin, and Franklin.

NORTHWEST TERRITORY. When the 13 American colonies won their independence from England, six of the old states, on the basis of their old sea-to-sea grants, claimed sections of the great unsettled regions between the Allegheny Mountains and the Mississippi River. But Maryland, which had no western lands, felt "that the back lands, claimed by the British crown, if secured by the blood and treasure of all, ought in reason, justice, and policy to be considered a common stock." So she refused to ratify the Articles of Confederation until the other states had given their western lands to the Federal government.

Having acquired this territory, Congress had next to devise some means for governing it, and in 1787 an ordinance was passed which has been declared to be second in importance only to the Declaration of Independence and the Constitution. It provided that the region should be divided into not less than three or more than five states; that it should be governed at first by officers appointed by Congress; that after it had 5,000 free male inhabitants a house of representatives should be elected, which could select a delegate to Congress with the right to debate but not to vote; and that when any of the divisions of the territory had 60,000 free inhabitants it should be admitted to the Union "on an equal footing with the original states." The law also allowed

freedom of religion, habeas corpus privileges, and jury trial. It declared that "schools and the means of education shall be forever encouraged," and finally, it prohibited slavery in the region "northwest of the river Ohio." The means of encouraging education had already been provided in an ordinance originating with Jefferson in 1785, which provided for the survey and sale of the land, and for the giving of $\frac{1}{32}$ of the national domain to the new states for the support of public schools.

The plan of government worked out by Congress for this region was followed in all later "territories" of the United States. Out of the original Northwest Territory were carved the states of Ohio, Indiana, Illinois, Michigan, and Wisconsin.



NORWAY. Land of the midnight sun, of still summer twilights that last until dawn, of snow-capped mountains, glaciers gliding to the sea, and mountain lakes as clear as crystal; of tumbling waterfalls and rushing rivers, of high pastures with cowbells tinkling among the precipices and deep valleys edged with somber pines and glistening birches; of fiords, placid and smiling or dark and threatening, whose beauty defies description—such is Norway, land of the Vikings of old, a very paradise for winter sports or summer tramps or cruises!

Norway (in the Norwegian language, "Norge") is the northwestern part of Scandinavia, that great peninsula which appears on the map as a dragon's head stretching out from the mainland into the northern seas of Europe. The dragon's mouth seems to

partly open toward the south, where the Skagerrack, an arm of the North Sea, cuts into the land to form two smaller projections, the southernmost parts of Norway on the one hand, and of Sweden on the other. Extending northward and eastward from here, a great ridge of mountains, chief of which are the Kiolen (also called Kjölen or Keel) Mountains, divides these twin countries and covers most of the surface of Norway, making it one of the most distinctly mountainous countries in Europe. These highlands, however, are rather a group of elevated plateaus than a system of mountain chains, grooved by many deep valleys cut during the Ice Age by the overwhelming march of glaciers.

But even more rugged and irregular than the surface of the land is its coast line—its cliffs broken

by innumerable fiords, and bordered by a fringe of about 150,000 rocky islands. If we were to measure all around these indentations and islands, we should find the coast-line to be about 12,000 miles, long enough to extend nearly halfway around the earth, and more than ten times the length of the country from the southwest to the northeast. We might expect to encounter violent storms along such a rough coast, but within the *skjaergaard* or "island-fence" the waters are comparatively smooth.

Although Norway extends almost 300 miles into the Arctic zone, and nearly a third

of the entire country is in the domain of the midnight sun and the winter darkness, the climate on the west, tempered by the warm winds from the Atlantic, is far milder than one might expect. Only on the east coast and among the central mountains is the cold severe. The winters, however, are long. Although in the same latitude as the almost uninhabitable Arctic regions of America and of eastern Siberia, the waters of the western fiords, warmed by the gulf stream drift, never freeze except in their upper extremities.

If we arrive at Oslo, the capital and largest city (see Oslo), in the month of February, we shall find the national winter sport of skiing at its height. The hills and mountains about the city, now covered with snow, are the pleasure ground for the entire populace. With their skis or their sleds they make their way to the top of Holmenkollen Mountain to come shooting back at

lightning speed over the five-mile course from the very top of the mountain to the long level stretches of the foot-hills. And on Holmenkollen Bay when

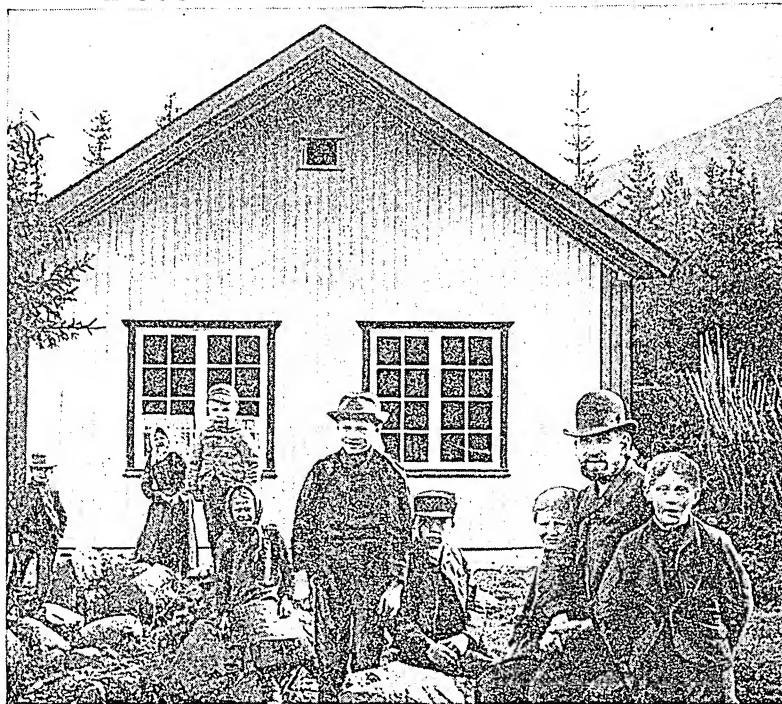
the ski-jumping contests are held, all the shops are closed and at least 40,000 enthusiastic spectators will be found on the mountain-side north of the city. Another famous sporting center is Finse, which lies in the great snow-fields, 4,000 feet above the sea, half a day's journey by rail from the capital. Here reindeer-drawn sleds meet one at the railroad and skiing may be enjoyed the year round.

With the approach of summer we may follow the popular custom of tourists, strap our knapsacks on our backs and start out on a walking trip through one of the many lovely valleys in central or southern Norway. It is hard to imagine a more pleasurable way of spending a vacation than this, with healthful exercise in the invigorating climate among surroundings of surpassing loveliness. The roads are excellent, in many places tunneled through the solid rock, or with overhanging crags beside a raging torrent; the scenery is ever-changing and interesting; and good accommodations and food

may be had at reasonable prices at the little posting stations and in inns along the route. The people are friendly and hospitable, thoroughly reliable and honest, and many of the better educated Norwegians speak English fluently.

The valleys are the chief agricultural regions, which comprise less than four per cent of the total area.

A COUNTRY SCHOOL HOUSE IN NORWAY



The hardy Norwegian boys and girls enjoy outdoor life immensely, but they also have keen appetites for things that books can tell them. This is a country school house among the rugged hills of the North.

CHIEF FACTS ABOUT NORWAY

Extent.—Southwest to northeast, about 1,100 miles; east to west, 60 to 250 miles. Area, about 125,000 square miles; coast-line, including fiords and islands, about 12,000 miles. Population, about 2,815,000.

Natural Features.—Surface a rugged tableland, with numerous isolated mountain masses, snow fields, and glaciers. Chief ranges: Kiølen (Kjölen or Keel) between Norway and Sweden (highest point, Jaeggevarre, 6,283 feet); Dovre Fjeld (Snehaetta, 7,615 feet); Rjondane Fjeld (Högronden, 6,929 feet); Jötun Fjeld or Jotunheim (Galdhøpiggen, highest mountain in Scandinavia, 8,399 feet). Largest glacier in Europe, Jostedalstraø (area, 580 square miles). Principal fiords: Oslo, Bukken, Hardanger, Sogne, Nord, Trondhjem, Geiranger, Vest (West), Lyngen, Varanger. Chief rivers: Glommen, Drammen. Numerous lakes.

Products.—Oats, barley, rye, wheat, potatoes; cattle, sheep, and dairy products; cod, herring, mackerel, and other fish; whale oil; iron, copper, nickel, silver; lumber and timber products, chemicals, paper, and food products.

Cities.—Oslo (capital, 250,000); Bergen (100,000); Trondheim (55,000); Stavanger (46,000); Drammen, Skien, Kristiansand, Haugesund, Alesund, Kristiansund (over 15,000).

[illegible]

173

The Saetersdal, a long deep valley in the southwest, is particularly interesting. Steep mountain walls cut it off from the rest of the country, and there the inhabitants still cling to their ancient habits and peasant costumes.

The farmsteads all over Norway are built of timber and comprise four or more separate buildings surrounding an open square. Of these buildings the *stabbur*, or storehouse for food, is picturesque, with a bell-tower, broad overhanging eaves, and with piles at each corner which raise the building several feet off the ground. Frequently the buildings are thatched with sod, in which grass and flowers and even small trees grow, so that it is not an uncommon sight to see the nimble mountain goats grazing on the low steeply pitched roofs. In addition to their lowland farms most of the farmers possess *saeters*, or mountain pastures, often one or two days' journey distant, where the cattle are sent to graze during the summer months and where the winter supply of cheese is made. One of the most beautiful of Scandinavian songs is 'The Saeter-Maiden's Sunday' by Ole Bull, Norway's great violinist. This depicts the loneliness and the longing of the solitary maiden who is left to care for the cattle, so far away from her home and companions.

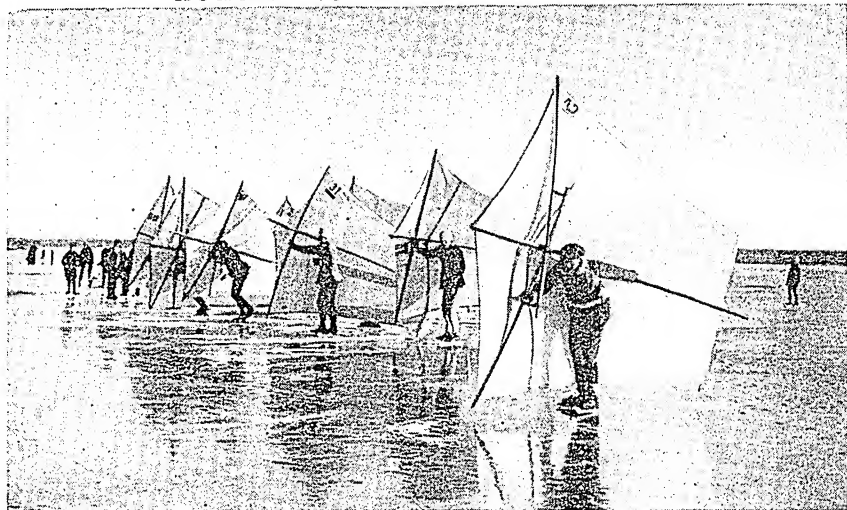
If we should tire of walking, we may vary our trip with boat rides on the numerous lakes, where a regular posting service is maintained, or we may hire a native vehicle at any posting station. These vehicles are light two-wheeled affairs, adapted to the narrow roads and to the short stocky Norwegian horses that are remarkably fast and sure-footed.

If we enjoy mountain climbing we shall find ample opportunity to indulge in this sport. The Kjölen Mountains, which separate Norway from Sweden, extend downward across the country from the north in many peaks and high plateaus. From the great central valley called the Gudbrandsdal, the courageous are invited by the Dovre Mountains to the north or the glittering peaks of the Jotunheim to the south. Skirting the valleys are the wonderful forests of pine and fir, one of the charms of Norway, as well as the source of one-fourth of her national wealth. As we ascend to the higher reaches the evergreens are replaced in turn by birches, dwarf willows, and reindeer moss, and finally we reach the vast silent regions of perpetual snow and ice. Norway has the most gigantic glaciers in all Europe; one of them

covers 580 square miles, is 1,400 to 1,600 feet thick, and thrusts scores of branches, like giant arms, into the neighboring valleys and in some cases even to the sea.

But of all the wonders and the charms of Norway, none can compare with the majesty and the sublimity of her fiords, those long arms of the sea extending far inland, sometimes more than a hundred miles—twisting and turning among the mighty precipitous

HUMAN "ICE-BOATS" IN NORWAY



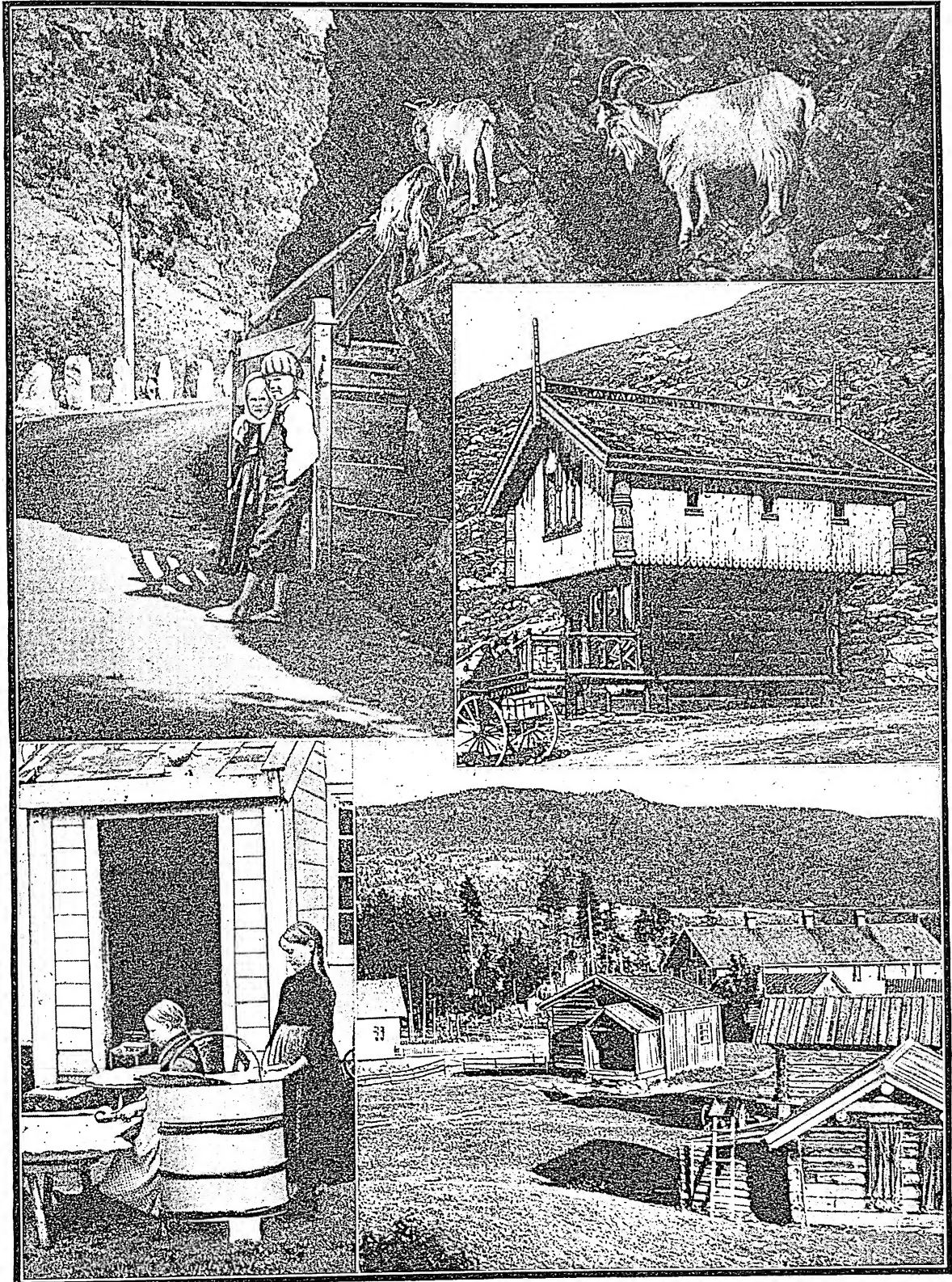
These boys are just starting a skate-sailing race. This is a popular sport in the long Norwegian winters. Good skaters become skillful at handling the sails to get the most advantage from the wind, and in a stiff breeze they attain a tremendous speed.

cliffs of the towering mountains. Tiny villages like toy models cluster at the water's edge; *saeters* with their little patch of green perch far up the mountain in almost inaccessible nooks; hundreds of waterfalls leap from the cliffs; and above all the hoary head of the glacier mirrors itself in the still waters of the fiord thousands of feet below.

If we should take a summer cruise we would find the countless splendid harbors filled with ships. Doubtless we should visit Stavanger at the head of the lovely Bukken fiord, quaint old Bergen, the second largest city in Norway, the birthplace of Ole Bull, and one of the chief trading stations of the old Hanseatic League; and the seaport Trondheim, the third city of Norway, the ancient spiritual and intellectual center of the north, famous for its magnificent Gothic cathedral, the grandest church in all Scandinavia, where the kings of Norway are crowned.

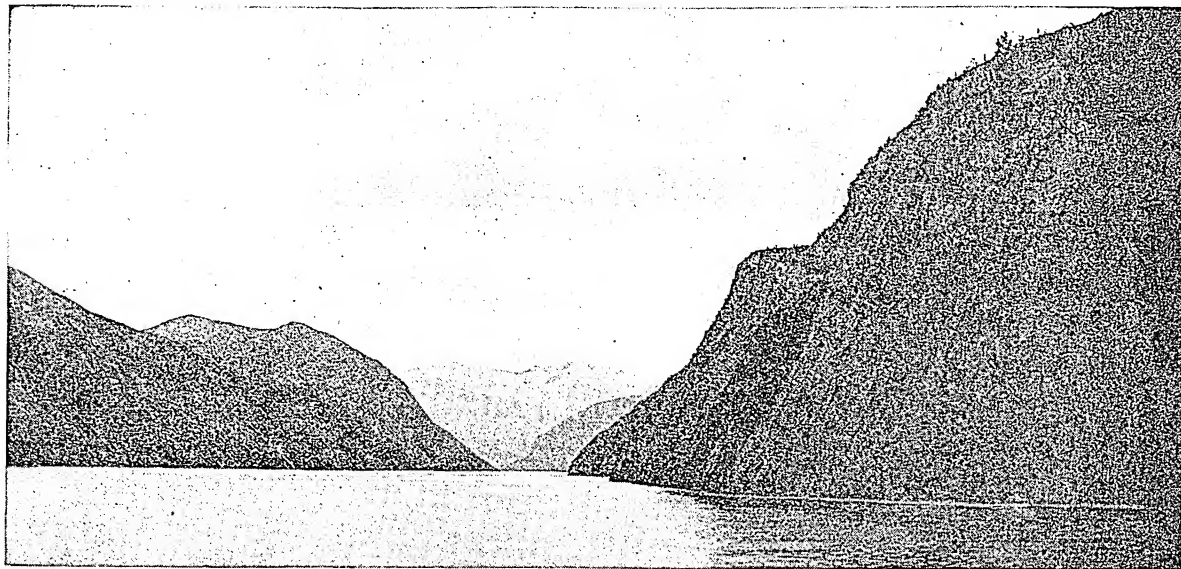
One hundred miles north of the Arctic Circle, we should reach the wonderful Lofoten or Lofoden Islands lifting their steep jagged snow-capped peaks 4,000 feet above the sea, their lower levels enlivened by millions of eider ducks, whose down is so valuable. Between two of these the rushing tide pent up by the island barrier forms the famous Maelstrom whirlpool. These five islands are the center for the Norwegian cod fisheries. During the first months of the year nearly 100,000 hardy Norsemen from

"STRAY SHOTS" FROM THE CAMERA IN NORWAY



These snapshots, taken by a traveler in Norway, show goats climbing the steep sides of one of the fine mountain roads, a farmer's high-perched storehouse, a group of farm buildings in the pine-clad hills, and peasants making bread. The countryside of Norway has a clean orderly appearance which reflects the careful industry of the people.

WHERE THE FINGERS OF THE SEA GRIP THE LAND



Here is one of those majestic fiords of Norway, which stretch far inland, always beckoning the people of these rugged hills out to the sea. We may imagine the ancestors of the ancient Northmen trying out their first small boats in these sheltered inlets, and gradually gaining confidence, until they yielded to the call of the open ocean. From that day on, the deep seas have laid their grip upon the men of this Northland, drawing them as sailors to the four corners of the world.

different parts of the coast answer the call of the sea, as did the Vikings of old, and congregate here to take part in this mighty industry. Hundreds yearly lose their lives in this dangerous work.

Near by is Narvik, the terminus of a railroad which cuts across the Scandinavian peninsula from the Swedish port of Lulea on the Gulf of Bothnia, and one of the two most northerly railway stations in the world. Narvik is a busy little place, for it exports annually millions of tons of iron ore, brought from the mines of northern Sweden.

Two hundred and fifty miles north of the Arctic Circle, where sunset and sunrise meet, is Tromsø, a city of 10,000 inhabitants, a busy trading post for fur and fish. During the long winter night, from the middle of November to the end of January, the city is lighted by electricity—as are all the buoys and lighthouses along Norway's coast. A sign of the desire of the people of these remote northern regions for culture and learning is the fact that this little city has a college and a museum of natural history.

Finally we reach Hammerfest (3,700 inhabitants, founded in 1787) the northernmost town in Europe, visited by tourists from all nations who come to view the splendors of the midnight sun. For in Hammerfest the sun does not set from the middle of May to the end of July, and the long summer day is a busy time for this little port. Great warehouses and hundreds of ships festooned with drying fish line the harbor; the odor of cod-liver oil, the most valuable commodity, pervades the air; whaling expeditions bring in their haul, while Russians and Finns, English, Germans, Swedes, and Lapps, fill the quays with a picturesque throng, chattering in many tongues. Snow lies on the mountains round about,

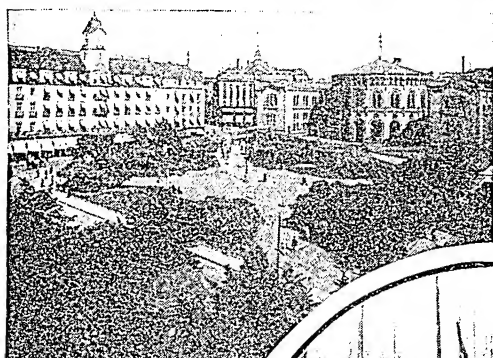
but the grass is green on the slopes and wild flowers bloom in every sheltered nook, for though Hammerfest is 300 miles north of the Arctic Circle its average winter temperature is warmer than that of New York.

Fifty miles north of Hammerfest the coast of Norway and of Europe reaches its farthest point north in the gray barren cliffs of the North Cape; and Svalbard, that large valuable group of islands placed under the sovereignty of Norway by the Peace Conference in 1919, lies far north in the Arctic Ocean, a two days' journey distant. This archipelago of five large islands and many small islands has recently become of considerable importance because of the immense coal deposits, which are now being worked intensively by Norwegian and foreign companies. Other mineral resources, still undeveloped, include iron, copper, and zinc.

Although Norway has little land under cultivation, the farmers get the best possible results out of their small tracts. Oats is the chief grain produced, but none of the cereals are raised in sufficient quantities to supply the needs of the country. Rye may be called the Norwegian's "staff of life," this and barley being the chief bread cereals. Wheat, being less hardy than the other grains, is produced in smaller quantities, and only in the southern parts of the country. Potatoes grow easily in almost all of the inhabited districts, and are one of the chief foods of the people. Cattle and sheep are kept in large numbers; and coöperative dairies have been established, and quantities of butter and cheese are made for export as well as for domestic use. The nomadic Lapps in the far north keep herds of reindeer, which supply them with meat, milk, and hides, and which are also employed as draft animals (see Lapland).

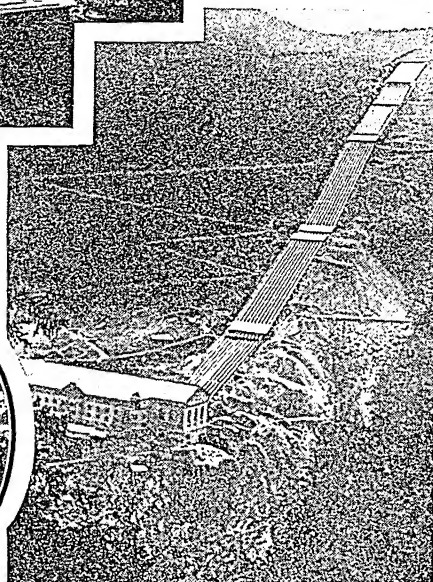
THE OLD AND THE NEW ENRICH LIFE IN NORWAY

MODERN AND SMART is the Grand Hotel, the building with many awnings which we see in the picture below of the Eidsvolds Plads in Oslo, capital of Norway. To the right is the quaint old Parliament House, with its round central part and two long wings. The city was founded by Harold "the hard ruler" in 1048, not long after daring Viking prowls had touched American shores.

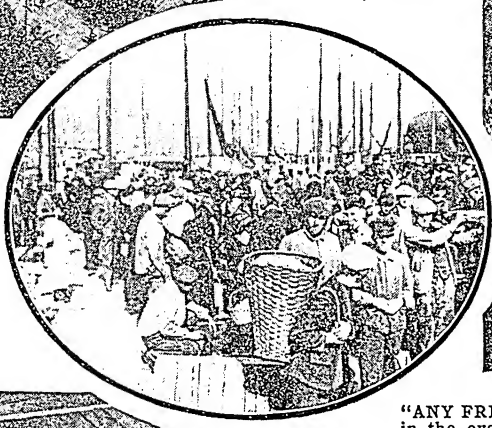


FAIR GIRLS of the Geiranger Fiord region greet us in local costume, above.

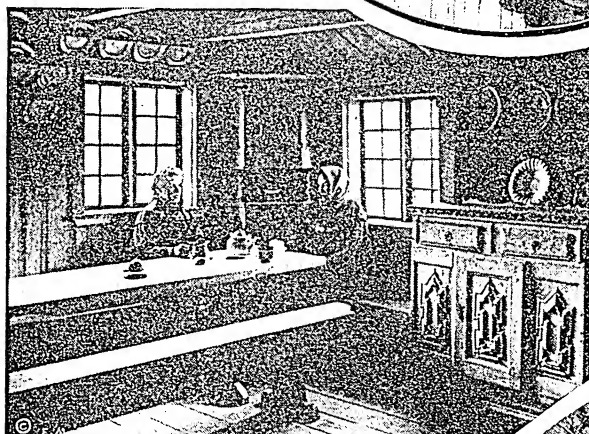
HUGE PIPES bring water to the great hydroelectric plant at Rjukan, below. Here the greatest waterfall in Norway is harnessed and nitrates are made from the air. Norway is a shining example of water-power development. Remote farms, factories, railways, all use electricity for lights, heat, and power.



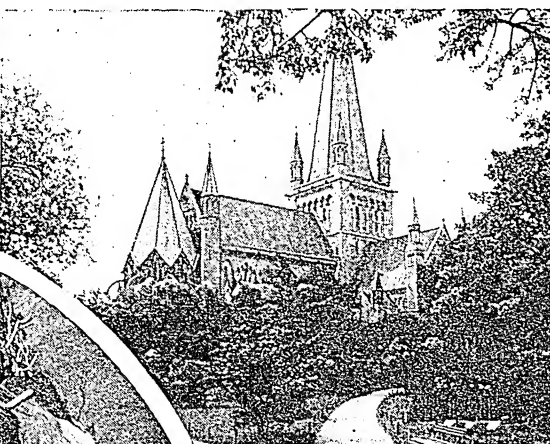
MANY OLD SAGAS must have been recited in the room below, which dates from the 15th century, when living was hard, stern, and beautiful, as we may judge from the fine strong lines of the furniture, the simple carving, and the staunch old platters and bowls.



"ANY FRESH FISH TODAY?" Bergen's fish market, in the oval, is one of the busiest places in Norway. The old-time romantic but dangerous fishing fleet has now been largely replaced by modern vessels equipped with steam auxiliary engines, or motor boats.

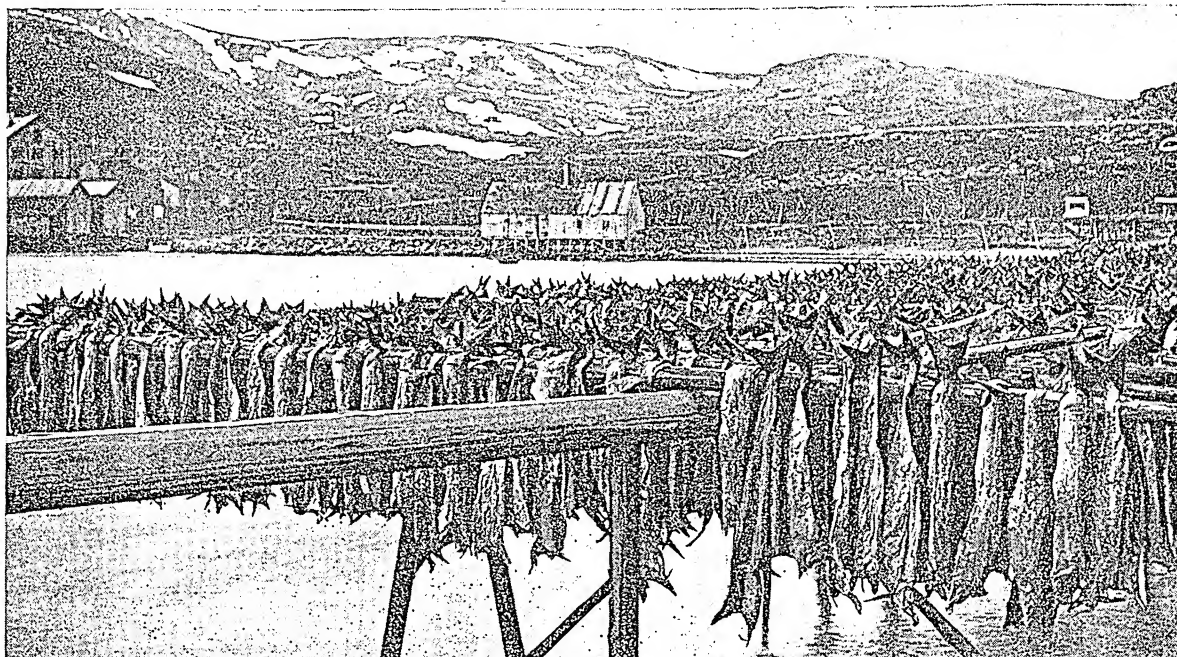


THE LAPLANDERS are a mysterious race who live in the northern part of Norway, Sweden, Finland, and Russia. These Norwegian Lapps at the right, squatting gloomily before their tepee-like tent, are typical of this unchanging race which has lived for more than 3,000 years among the tall, blond, civilized Norwegians without adding an inch to its five-foot average height or altering a jot of its half-barbarous manner of life. The Lapps herd reindeer and eat dried deer meat, fish, and yellow raspberries. Of the 30,000 Lapps, 19,000 live in Norway.



KINGS AND QUEENS still go to the old slate-blue Cathedral of Trondheim, above, to be crowned. The famous old Viking, St. Olaf, is buried in this cathedral.

CURING COD FISH AT HAMMERFEST



Although Hammerfest is the northernmost town of Europe, situated on Kvalø or Whale Island, only 60 miles from the North Cape, it is still warm enough there the year around to carry on the work of the fisheries, and in summer the heat sometimes becomes oppressive. Quite a bit of work can be done in a day there, for the sun does not set from the middle of May to the end of July.

The forests and fisheries are Norway's chief natural sources of wealth. Fishing is the oldest of Norwegian industries, and still remains one of the most important, the product sometimes amounting to more than \$45,000,000 in a single year. Norwegian cod, either salted or dried in the form of "stock-fish," and cod-liver oil are shipped to the various European countries and to America. Herring, mackerel, salmon, and other kinds of fish are also abundant. The heads and other waste parts of the fish are used for fertilizer. Whales are hunted in the Arctic Seas, and whale oil is exported in considerable quantities. More than 20 per cent of the total area of the country is timber land, and about three-fourths of this is pine. Lumber, wood pulp, and other forest products are among the most important exports.

The mining industry is relatively unimportant. Copper, nickel, and silver are found, and considerable quantities of iron; but coal is entirely lacking on the mainland. In spite of the lack of coal, however, Norway has been able to develop manufactures to a considerable extent, owing to its splendid water-power resources. Chemicals, machinery, woodenware, wood pulp, and paper are leading products.

The Norwegians are among the busiest sea-carriers in the world, with a merchant marine greater than that of many a far larger nation. Steamers are the most important means of communication between Norwegian ports, although railways also are well developed. Telegraph and telephones are found in the remotest places and the mail service is prompt and adequate. Education is compulsory and there

are excellent schools and more than 1,000 state-endowed libraries. The Royal Frederick University at Oslo is the chief educational institution. The state church is Lutheran. In 1907 women were given limited suffrage, and since 1913 they have enjoyed the franchise on an equal footing with men.

History

Out of its dim past as a land of the Vikings (*see* Northmen), Norway emerged in the 11th century as a united, Christian kingdom. In 1397 it was joined with Denmark and Sweden in the Union of Kalmar. Sweden later seceded from this union, but for more than 400 years Norway was little more than a dependency of Denmark. Because Denmark sided with France in the Napoleonic wars (1796-1815), the opposing powers backed Sweden in taking Norway from the Danes in 1814. For nearly a century Norway was ruled by the Swedish king, though it retained its separate government. In 1905 long-standing disputes led its parliament (*storting*) to dissolve the union. A national vote gave the throne to Prince Charles of Denmark, who was crowned Haakon VII (1906).

With its long-sought independence, Norway flourished for about a third of a century as a peaceful, progressive, constitutional monarchy. Then suddenly, on April 9, 1940, its peace and freedom were shattered by German invasion. Supported by the naval and air forces and the expeditionary troops of Great Britain and France, Norway battled valiantly to resist the Nazi invaders. But Germany's overwhelming power, aided by treason and sabotage within Norway, crushed the nation's resistance. Driven back to the far north by German mechanized units, the Allies were finally compelled to abandon their sole remaining foothold in the country, at Narvik. Then, on June 9, as the Norwegian army surrendered, King Haakon VII and his government fled to London. The German army of occupation ruled the country through a "puppet" Norwegian government, but King Haakon and his ministers continued to proclaim their sovereignty over the "free people" of Norway. (*See also* World War, Second; and Norway in FACT-INDEX at the end of this volume.)

NOUN. A noun is a word that *names*. It may name anything of which anybody may think or speak—as *school, America, kindness, justice, children*. If it is the name of one particular person or object or place, it is called a proper noun. In this sense “proper” means “belonging exclusively to.” Your name, *Frank* or *Mary*, is a proper noun, because it belongs to you and distinguishes you from other persons. *Fido, Chicago, America, Saturday, The Mauretania, Paradise Lost*, are proper nouns. Some proper nouns also denote groups of persons, or a member of a group,—as *Americans, Frenchmen, Democrats, Baptists*. Any noun that is not a special individual name is a “common” noun—as *kindness, cloth, city, book*, etc. Such nouns are called “common” because they belong to more than one person or thing. A special kind of common noun is the “collective” noun, which stands for a group of things or persons—as *class, grove, flock, jury*.

Most nouns in English have two forms, according to whether they mean one object or more than one. The form which denotes one is called the singular number; that form which denotes more than one is called the plural number—as *bird, birds, woman, women*. The plural is generally formed by adding *s* to the singular. Sometimes the *s* plural changes the spelling of the singular—as *city, cities; self, selves*. When adding *s*, nouns ending in *y* after a consonant change the *y* to *ie*; and several nouns ending in *f* or *fe* change the *f* to *v*. Some nouns in *o* add *es*, others add *s* only—as *cargo, cargoes; piano, pianos*. Nouns that end in a sound difficult to pronounce with a final *s* add *es*—as *church, churches*. A few nouns form their plurals by adding *en* or by changing the internal vowel as—*child, children; tooth, teeth*. This was the common way of forming plurals in Old English, or Anglo-Saxon. There are also some foreign plurals in common use—as *stratum, strata; crisis, crises*. A few nouns make no change for the plural as—*deer*.

How Nouns Become Possessive

Many nouns, especially those denoting persons or animals, have another form called the possessive case, because it is chiefly used to denote possession, like the genitive case in Latin. Singular nouns, and all plurals not ending in *s*, add the apostrophe and *s* to form the possessive—as *lady's, children's, Burns's*. Plurals ending in *s* add the apostrophe only—as *ladies', boys'*. In ordinary use, most names of things are not used in the possessive; instead of *the book's cover, the chair's back*, the usual form is *the cover of the book, the back of the chair*. But nouns denoting time are often found in the possessive—as *a day's work, a night's lodging, a seven days' journey*.

Besides the possessive case, nouns, like pronouns, have two other cases, according to the construction in which they are used. Nouns do not change their form to distinguish these cases, though most pronouns do. Nouns and pronouns used as the subject substantive of a verb are said to be in the nominative (“naming”) case. Nouns and pronouns used as the

direct or indirect objects of verbs (*see Verbs*), as the objects of prepositions, and as the subjects of infinitives are said to be in the objective case. A noun or pronoun in apposition with another (that is, used to modify or explain the meaning of another noun or pronoun meaning the same person or thing—as “Caesar, the conqueror”) is put in the same case as the word it modifies.

To give in order the various forms which a noun or pronoun may take to indicate different meanings or uses in the sentence is called “declining” it, or giving its “declension.” Thus the declension of *child* is: singular, nominative and objective, *child*; possessive, *child's*. Plural, *children, children's*.

In addition to number and case, nouns, like pronouns, have two other properties: gender and person. (For a discussion of grammatical person, *see Pronouns*.) Nouns, except those in direct address, are always in the third person. By gender in English is meant merely whether the noun denotes male or female, or the absence of sex—as *prince, princess*. Nouns denoting males are masculine; those denoting females, feminine; and those denoting things without sex, neuter. Nouns which refer to both sexes are said to be of common gender—as *people, birds*, etc. Gender is of little importance in English.

The Work that Nouns Can Do

Some of the chief constructions in which nouns may be used are illustrated in the following sentences:

Subject and predicate noun: A *dollar* saved is a *dollar* earned.

Direct object: He saved a *dollar* a week.

Object of a preposition: He kept account of every *dollar* that he spent.

Indirect object: Association gave that *dollar* a peculiar value.

Secondary or complementary object: I will make your wages a *dollar* a day.

Subject of an infinitive: I saw the *dollar* disappear down the crack.

Possessive modifier: Give me a *dollar's* worth of sugar.

Adnominal use (exactly like an adjective): This is a *dollar* bill.

Appositive: His pay—a round silver *dollar*—seemed enormous.

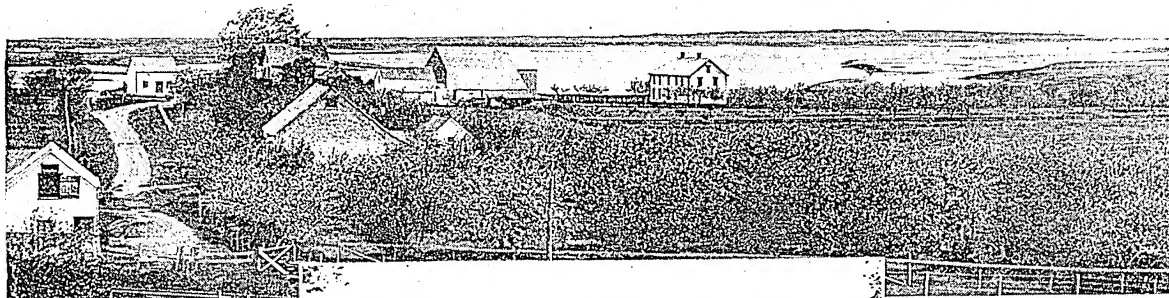
Nominative of address: Oh, *dollar*, why did you slip away!

Nominative of exclamation: A *dollar*! what does that amount to?

Nominative absolute: He turned away, his precious *dollar* clutched tightly in his hand.

NOVA SCOTIA, CANADA. Geographers have aptly called the maritime province of Nova Scotia “the doorstep of the continent,” for it lies at the entrance to the St. Lawrence River, the passageway to the interior. It occupies the southeastern peninsula of Canada and the adjoining island of Cape Breton, and is connected with the mainland only by a slender neck of land. The principal city is the great port of Halifax, one of Nova Scotia's 12 splendid harbors. Though one of the smallest provinces of Canada, having an area of only 21,068 square miles—less than that of West Virginia—Nova Scotia supports a large population in the settled districts, having a total of 512,846 people. The majority

AS IN THE DAYS OF 'EVANGELINE'



are overwhelmingly of British stock, many being descended from United Empire Loyalists who came from the New England states during the Revolutionary War. With the descendants of English settlers these make up the largest racial group, closely followed by the Scots. There are over 56,000 each of Irish and Acadians. One-third of the 20,000 Negroes in Canada are in Nova Scotia, descended from 600 slaves who were brought from Jamaica in 1796 to work on the citadel of Halifax.

Nova Scotia is a region of extensive sea line, of bold rugged shores, and noble highlands. Since the earliest settlement, fishing has been a leading industry. The province owes a great deal of its steadfastness in times of depression to the fact that fishing and farming are engaged in by the same persons. Many farmers also engage in other occupations as well.

In the north are rich coal fields and a large steel manufacturing industry. There are iron-ore deposits. Manganese, copper, and gold are produced on a small scale and gypsum is quarried.

The Acadians of Today

Acadians are farmers as in the days of Longfellow's 'Evangeline', and the "shores of the Basin of Minas" and the "little village of Grand Pré" present much the same appearance today as when—

. . . vast meadows stretched to the eastward,
Giving the village its name, and pasture to flocks
without number.
West and south there were fields of flax, and orchards,
and cornfields,
Spreading afar and unfenced o'er the plain; and away to
the northward
Blomidon rose, and the forest old, and aloft on the
mountains
Sea-fogs pitched their tents, and mists from the mighty
Atlantic
Looked on the happy valley, but ne'er from their station
descended.



You see things haven't changed much in the villages of Nova Scotia since the days of Evangeline, so far as the simplicity of life is concerned. In the picture above, we are looking across the village of Gasperaux, and below is the village of Grand Pré itself.

When the peninsula passed from France to England, in 1713, the name Acadia was dropped and that of Nova Scotia ("New Scotland") became the official name of the colony. Some of those who had been driven from their homes found their way back in

later years, and from these are descended the Acadians of today. (See Acadia.)

Nova Scotia is a favorite summer resort with the people of the eastern United States because of its delightfully mild summer climate and the picturesqueness of its coasts, meadows, and orchards. The marshy land which spreads inland along the rivers flowing into the Bay of Fundy is amazingly fertile. Nearly all of it has been diked to protect it from the high Fundy tides. Much of the beautiful Annapolis and Cornwallis valleys is covered with apple orchards, and large shipments of apples are sent in cold storage to England.

Almost from the founding of Port Royal (now Annapolis Royal) by the French in 1605, Nova Scotia was a focal point in the struggle between the French and the British for the New World. Fighting was almost continuous until the final blow to French aspirations was delivered in 1759 by the capture of Quebec (see French and Indian War). The previous year saw the capture of the "Dunkirk of the North"—the famous fortress of Louisbourg, which the French had built on the Atlantic coast of Cape Breton Island at a cost of \$10,000,000 to be the keystone of their naval power in America. Although the peninsula was won by the British in 1713, the island was not ceded until the peace of 1763. In 1867 Nova Scotia became part of the Dominion of Canada. (See Cape Breton Island; Halifax; Tupper, Sir Charles.)

The STORY-TELLER and HIS MAGIC CARPET

NOVEL. Everyone likes stories. Long ago when there were few books and only priests and clergymen could read, stories reached the mass of the people by word of mouth. But when printing was invented and learning was made more common, there were thousands of readers to be satisfied. Drama still answered the desire for action, but after all there were relatively few people within easy reach of theaters, and relatively few human experiences that could be put on the stage. It was to supply the craving of the average reader for a fuller and more complete view of life that the novel came into being. And this is the secret of the novel's power; it gives contact with life; it puts new meaning into everyday affairs, and it broadens our horizon. People who read the best novels have a magic carpet that takes them where they will—to visit distant lands and ages, and to mingle with all sorts and conditions of men. Many of the characters in fiction are more real to us than those in history; we feel as well acquainted with them as with the people we meet in real life and often understand them better.

The Medieval Story-Tellers

Nothing exactly like our novel of today was known in ancient times, though the Greeks and Romans had their prose tales and romances, such as the 'Golden Ass' of Apuleius, which contains the beautiful story of Cupid and Psyche. The immediate ancestor of the modern novelist was the minstrel of the Middle Ages who traveled from place to place telling or singing his tales. Romances long drawn out and full of high adventure were popular with the upper classes, because they found in them an idealized picture of their own lives (see Romance). The lower classes, who got the ragged end of life under the feudal system, liked tales that poked fun at the valiant knights and pious churchmen. They liked stories of rogues and rascals seeking adventure or of life as they themselves lived it. So alongside of the metrical romances we find the *fabliaux*, telling lightly in verse stories of ordinary life; and similar stories in prose, called by the Italians *novelle*, meaning "new stories," from which the English term "novel" is derived. A little later there appeared in Spain another type of story dealing with low life, the "picaresque" novel, which told at considerable length the adventures of a *picaro*, or rogue, as the romance sang the noble deeds of the knight errant. Somewhat akin to these picaresque novels and yet different from anything that had appeared before was Cervantes' famous burlesque romance 'Don Quixote'. (See Cervantes.)

WHEN the average reader speaks of "a good book," we can be almost certain that he has in mind a novel. The novel is only one of many forms of literature, and one of the youngest of them all, yet it has outstripped all the others in popularity. More novels are written and read today than all the poems, dramas, and essays put together. No other kind of writing makes so strong an appeal to the great mass of people, or has so tremendous a power for good and evil. The accompanying article tells you how this youngest and most popular of literary forms came to be born, and sketches its development in the hands of the great novelists down to the present day.

The two classes of stories—the romance on the one hand, and the *fabliau*, *novella*, and picaresque novel on the other—grew up side by side and were the fore-runners of the two main types of modern prose fiction the "romance" and the "novel." The term novel is now usually applied to a narrative of considerable length with a more or less intricate plot, which pictures life as it is, dealing with characters and events that have been or might be real. The romance gives greater freedom to the imagination, deals with more unusual aspects of life, and is usually more concerned with telling an exciting story than in the study of character. Thus Scott's 'Ivanhoe' is a romance, while George Eliot's 'Mill on the Floss' is a novel. In common usage, however, any work of prose fiction is called a novel, and we speak of "realistic" and "romantic" novels.

Many prose romances were written in England in the Elizabethan Period, the age of Shakespeare, though they are quite overshadowed by the great dramas of that time. Lyly's 'Euphues' is remarkable for its elaborate artificial style, its involved and nicely balanced phrases. Sir Philip Sidney's 'Arcadia' is a long-drawn-out pastoral romance interrupted with passages of verse. Both of these romances were written for the upper classes and did not appeal to the ordinary man.

Bunyan's 'Pilgrim's Progress', the great Puritan prose epic, did teach the masses and still holds its popularity because of its truth to human nature. Although it is an allegory, it is, strange to say, in some ways very much like the old picaresque or rogue novel; only here the adventures of the hero are symbolic and spiritual rather than worldly.

The same men and women and children who liked 'Pilgrim's Progress' were delighted with Defoe's 'Robinson Crusoe'. Although the adventures of Crusoe on the lonely island are almost entirely pure imagination, Defoe's marvelous power of description makes them seem absolutely true to fact.

The Birth of the Modern English Novel

'Robinson Crusoe' is often called the first English novel. Yet it is hardly a novel in the modern sense. It is a tale of adventure in a far-away place rather than of life as we know it; it lacks plot, being a series of happenings loosely strung together, and there is no character analysis. The novel of ordinary domestic life and manners owes its beginning, in the middle of the 18th century, to an accident. Samuel Richardson, a London printer, was invited by a publisher to prepare a volume of letters which might serve as models to country readers. It occurred to Richard-

son that the letters would be more instructive and interesting if they were made to tell a connected love story and point a moral. The result was 'Pamela, or Virtue Rewarded'. So great was its vogue, especially among women, that it was followed by another novel 'Clarissa; or the History of a Young Lady', usually considered Richardson's masterpiece, and then by one with an ideal man as its hero, 'Sir Charles Grandison'. Richardson's characters in letters of incredible length devote pages and pages to discussions of what they say, think, and feel. The ladies, who are virtuous and saintly beyond belief, are continually weeping or fainting, the villains are very black, and the heroes models of copy-book perfection. No writer before had so painstakingly dissected the hearts of his heroines and analyzed their feelings. It was this that held the attention of his readers, but to one man at least Richardson's sentimentality and his pretentious moralizing were distasteful. Henry Fielding was moved to burlesque 'Pamela' much as Cervantes had burlesqued the old romances. But in writing 'Joseph Andrews' he became so interested in his characters that the result was a realistic novel rather than a burlesque. Here, and most of all in his masterpiece 'Tom Jones', we feel that his characters are real flesh and blood creations, neither entirely good nor entirely bad, but decidedly human.

Neither Richardson nor Fielding, nor their contemporaries, Smollett and Sterne, great as they were and important as their work was in the history of the novel, have a wide appeal today. But one novel written just a little later still remains a favorite of young and old. That is Goldsmith's 'Vicar of Wakefield', a delightful story of simple home life. (See Goldsmith, Oliver.)

Fashions in Novels

Novels usually follow the fashion of the times in which they are published. When in the early part of the 19th century the movement toward romanticism came to its climax, there was a great interest in the Middle Ages, and the historical novels of Sir Walter Scott were a natural outcome. It is true that there were novels which had pretended to be historical, but it was not until research into former periods had been undertaken in real earnest that the historical novel developed to the full with all its wealth of background and detailed description. The Waverley novels of Sir Walter Scott were copied all over Europe.

But during the same period, far off in a little English village lived a gentlewoman who wasn't interested in depicting the world of history or even the world of her own day. Jane Austen wrote novels which gave a universe in miniature—the life of her own rural England. The sentimentality of Richardson and of the Gothic romancers who filled their books with haunted chambers and mysterious castles aroused her sense of the ridiculous. She wrote about the people that she knew and with sly humor showed character so skilfully that Sir Walter Scott liked to compare

her with Shakespeare. 'Pride and Prejudice' and 'Emma' are books which sparkle at the third reading as much as at the first.

The 19th century saw the field of the novel immensely widened, to keep pace with the growing complexity of life. Science, religion, social reforms, labor and capital, war and peace, and many other problems were stirring people's minds. The new era of machinery had brought people into town where they lived miserably under unsanitary conditions (see Industrial Revolution). Old laws no longer fitted new customs and a new race of writers grew up to combat them. Charles Kingsley, Mrs. Gaskell, and, above all, Charles Dickens were writers of the humanitarian novel. Perhaps the first two writers felt just as keenly as did Dickens, but they did not possess in so great a degree the humor, pathos, power of description, and realism that made Dickens' work endure. His own story, which with some modifications forms the basis of the narrative in 'David Copperfield', is to most readers the most interesting of his novels.

Thackeray and George Eliot

Dickens was of the people; Thackeray belonged to the upper classes. History was fascinating to him and became the background of some of his best novels, 'Henry Esmond' and 'The Virginians' among others. The book by which most people know him best is 'Vanity Fair' in which he exposes the shams and meanness of the fashionable society he knew so well.

George Eliot (Mary Ann Evans), a woman who wrote a little later, did not show the world as a dramatic spectacle, as did Dickens and Thackeray. She was more interested in the minds and souls of her characters. She knew how to make the struggle in a little girl's mind as interesting as a battle. When one remembers that Maggie in 'The Mill on the Floss' is really George Eliot herself, it is easier to see why the author has such an uncanny insight.

These writers are representative of the main movements in the novel during the 19th century: Scott of the historic romance; Jane Austen of the novel of manners; Dickens of the humanitarian novel; Thackeray of the picture of society as a whole treated from without; George Eliot of the novel of the mind or psychological novel.

As we come down to recent and present-day English writers, we find Stevenson the disciple of Scott and the great French romancer Dumas in his love of romance and adventure; George Meredith, carrying the novel of the mind and manners to such an extreme of complexity that some people can't understand him at all, and Thomas Hardy, writing realistic stories of the English countryside which have all the elements of inexorable fate in a Greek tragedy.

Still later came Barrie, Bennett, Wells, Galsworthy, Conrad, and a host of others. Wells, who began with scientific romances somewhat in the style of the Frenchman Jules Verne, has become mainly

concerned, as in 'Joan and Peter', with social reform and education. Arnold Bennett, who writes books that resemble the old Flemish painters in their careful detail and their faithful description of ordinary experiences, has learned much from the great French masters of fiction. His best work centers about the "Five Towns" of the pottery industry of England. Barrie has a romantic whimsical style all his own. Galsworthy draws somber pictures of the injustices of modern society. Joseph Conrad, born in Poland, but living the greater part of his life as an officer in the English merchant marine, has written of the sea and of strange lands in novels that are masterpieces of style and of insight into character. Among the host of other recent English novelists who deserve mention are George Moore, follower of the French school of realism; Eden Phillpotts, who writes novels of Devonshire somewhat in the manner of Hardy; Maurice Hewlett, writer of artistic romances; William De Morgan, whose long and rambling but delightfully human novels have had many enthusiastic readers; W. J. Locke, loved for his humor and understanding and his sunny philosophy; and W. L. George, who is especially concerned with the study of women and their problems.

Fiction in America

The novel in America showed much the same tendencies as in England. James Fenimore Cooper in the first half of the 19th century "laid the foundations of American romance" and won the title of "the American Scott." Hawthorne probed deep into the recesses of the human mind and soul, but he set his stories in a twilight atmosphere instead of in the broad light of common day, and hence he was justified in calling them romances rather than novels. In the later 19th century and reaching well into the still more complex 20th century, we find Henry James, writer of psychological novels, still more subtle and appealing to a still smaller circle of readers than those of Meredith, and William Dean Howells, distinctly a realist of everyday American life. There has been a host of novelists since, and many of them have produced work of high quality, but it is still a question whether any of them may be called great (*see American Literature*).

On the whole the novel in America loses in comparison with that of England, but there is one field in which America has surpassed England, and that is in the short story. The short story is not merely a story that happens to be short, but is a distinct type of fiction, marked, as Brander Matthews tells us, "by its unity, its totality, its concentration upon a single effect or a single sequence of effects." In the hands of Poe and Hawthorne, and later of Bret Harte and O. Henry and others, the short story has reached a high degree of artistic development.

We can only glance at the novel in other lands. It is to Italy, in a sense, that we owe the novel form, but the Italian "novella" was really more like our short story than our novel. Alessandro Manzoni in

the 19th century is the first modern Italian novelist of international importance, and Matilde Serao and Gabriele D'Annunzio (the latter better known as a poet and dramatist) are his greatest successors.

In Spain there has been no name as great as that of Cervantes, but since the middle of the 19th century the novel has been a very popular form. The best-known names are Fernan Caballero, Pedro Antonio de Alarcón, Pereda, Galdós, and Blasco Ibanez, the last probably more widely read in England and America than in his own country.

In the Scandinavian countries Björnson, the greatest novelist of Norway, was followed by Selma Lagerlöf, who wove the folklore of Sweden into beautiful romances, and by Johan Bojer and Knut Hamsun, who have produced powerful realistic works.

Henryk Sienkiewicz, author of 'With Fire and Sword', and other historical romances dealing with the struggle of the Poles, is the chief representative of Poland. He is perhaps best known in other countries for his 'Quo Vadis', a historical novel of the time of Nero. In Germany in the 18th century Goethe wrote the most famous of sentimental novels, 'The Sorrows of Young Werther' and the great autobiographical novel, 'Wilhelm Meister'. Then came the picturesque humorous stories of Jean Paul Richter, and the romances of Tieck, Fouqué, von Kleist, and many others. Paul Heyse, Gottfried Keller, and Hermann Sudermann are among the most important German novelists of recent times.

In France it was not until the 19th century that the novel became one of the chief forms of imaginative writing. Victor Hugo and Alexandre Dumas were inspired by Scott to enter the realms of history and romance. Flaubert in his famous 'Madame Bovary' combined romanticism and realism. Balzac insisted that fiction must be based on observation and experience, and was largely influential in spreading realism throughout Europe. Zola went farther, attempting not merely to photograph, but to dissect human nature, and dwelling for the most part on its sordid and unhealthy aspects. French idealism was seen again in Romain Rolland's biographical novel 'Jean Christophe', which not only covered in detail the life of one man, but gave a wonderful picture of Europe before the World War.

The Russian Novelists

Perhaps no other country has had so great an influence on recent fiction as has Russia. The powerful novels of Gogol, founder of the modern realistic school in Russia, of Turgenev, one of the greatest prose artists of the 19th century, of Dostoyevsky, with his subtle psychology, and of Tolstoy, great in this as in many other fields, have come as a challenge to the rest of the world. While their influence has led to the emphasis of the darker side of life, they have done much to strengthen and vitalize the novel.

Now that hundreds of novels—good, bad, and indifferent—are published every year, it is important

for the reader to have a touchstone to test their worth. What makes a good novel? There are three essentials in the novel—characters, plot, and setting. A good novel represents lifelike characters talking and acting under interesting circumstances, and through their acts becoming involved in a complication of events which is brought to a satisfactory conclusion. In 'Henry Esmond', which many consider the most perfect novel in the English language, Thackeray shows his mastery in the analysis of character, in the structure of the plot, and in his description of the age in which the scene is laid. But many excellent novelists show no such harmonious development of these three elements. Dickens, for instance, often pays little attention to plot; while with Scott the portrayal of character is subordinate. It is impossible to lay down hard and fast rules, for it is the privilege of a genius to break all rules of art. But one thing we can demand of a novel and that is that it must ring true. Even a romance, which may have strange and unusual characters, must not violate the fundamental truths of human nature. Worst of all is the novel that pretends to picture "real life," and gives a false and distorted picture. It is hard to measure the harm that is done by books of this sort. For the novel has, with the possible exception of the drama, the strongest moral influence of all the forms of literature. This does not mean that the novelist should teach a definite lesson—indeed a too obvious moral purpose spoils a novel; but because he deals so intimately with real life, he cannot get away from questions of morality. For this reason we should be as careful in choosing the novels we read as we are in choosing our friends.

NOVEMBER. In the old Roman calendar November was the ninth month, as its name indicates, but it is now the eleventh owing to the change of the year's beginning from March to January. At the same time the number of days was increased from 29 to 30. It is said that the Roman Senate proposed to rename the month in honor of Tiberius, who succeeded Augustus as emperor; but he declined, saying: "What will you do, Conscript Fathers, if you have thirteen Caesars?"

NUMERALS. From the earliest times men have counted on their fingers, and the system of making straight marks or "tallies" as a record of numbers probably grew out of this practice. When the habit arose of "scoring" tallies with cross strokes into groups of five (thus, IIII IIII), each group represented the fingers of one hand. After a time this was found to be too small a unit, and in the end men almost universally adopted the "decimal" system of counting by tens, representing the fingers of both hands. The ancient Babylonians, however, used a "duodecimal" system of counting by twelves, derived from their study of the stars. We still use this duodecimal system in counting eggs, reckoning the hours in a day, inches in a foot, etc. It has the advantage of expressing thirds and quarters more conveniently.

Of all the older systems of number notation, the Roman system is the best known. Indeed, we still use it for certain purposes, such as marking the hours on clock dials, in numbering the volumes and chapters of books, and in inscriptions on buildings. In this system seven letters are used to represent numbers, with the value given below:

I	V	X	L	C	D	M
—	—	—	—	—	—	—
1	5	10	50	100	500	1,000

The letter *C* is the initial letter of the Latin word *centum*, meaning "hundred" and *M* of *mille*, "a thousand." When a letter of less value is written *before* one of greater value, the numeral represents the *difference* between the two values. Thus IV equals 4; XL equals 40; XC equals 90. When the letter is written *after* one of greater value, the sum of the two is represented. When a bar is placed over a letter its value is multiplied by 1,000. Thus \overline{V} equals 5,000; \overline{XIV} equals 14,000. From the following table giving Arabic equivalents the value of any Roman numeral can be found:

I... 1	XI... 11	XXI... 21	D... 500
II... 2	XII... 12	XXX... 30	DC... 600
III... 3	XIII... 13	XL... 40	DCC... 700
IV... 4	XIV... 14	L... 50	DCCC... 800
V... 5	XV... 15	LX... 60	CM... 900
VI... 6	XVI... 16	LXX... 70	M... 1,000
VII... 7	XVII... 17	LXXX... 80	MM... 2,000
VIII... 8	XVIII... 18	XC... 90	IV... 4,000
IX... 9	XIX... 19	C... 100	\overline{V} ... 5,000
X... 10	XX... 20	CC... 200	\overline{IX} ... 9,000

Advantages of "Arabic" Numerals

The Roman system has some serious shortcomings, as you will see if you try to add, subtract, multiply, or divide a series of numbers written in this way. For instance, try to find the product of:

XLVIII times MDCCXCIV

If we write the sums in the so-called "Arabic" numerals, the problem becomes much simpler:

48 times 1,794

In part this greater simplicity is due to the fact that each of the digits in the "Arabic" system is a single character (1, 2, 3, and so on, up to 9), instead of being composed, as most of the corresponding Roman numerals are, of several characters or letters (II, III, IV, and so forth). It is also due to the fact that the "Arabic" system is based on an improved principle, that of place value. In the number 555, for example, the 5 at the right stands for 5 units or ones, the middle 5 for 5 tens or fifty, and the one at the left for 5 hundreds. This makes possible a *decimal* system, the place value of the numbers increasing tenfold to the left and decreasing in the same ratio to the right.

The Arabic system of numbers is a convenient one, but before the zero was invented, for several hundred years after the system came into use, men found it difficult to write such a number as 1,030, or 3,042,050. The invention of the zero made possible

the simplified arithmetical processes in use today in place of the older ones which required the "abacus," or counting frame. It gave the world a system of numbers which has proved a great help in advancing both science and trade. The zero is for this reason considered one of the great inventions of the world.

In their earliest form the "Arabic" numerals are not Arabic at all, but come from the Hindus of far-off India. The first trace that we have of them (without the zero, however) is in some rock-cut inscriptions in Central India, which go back almost to 300 B.C. In Europe we find some examples of the nine digits (again without the zero) in manuscripts which date

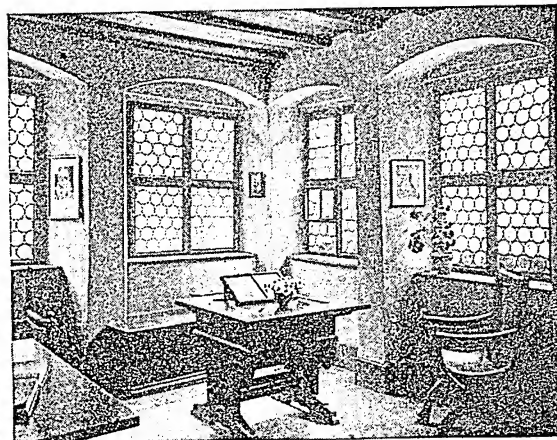
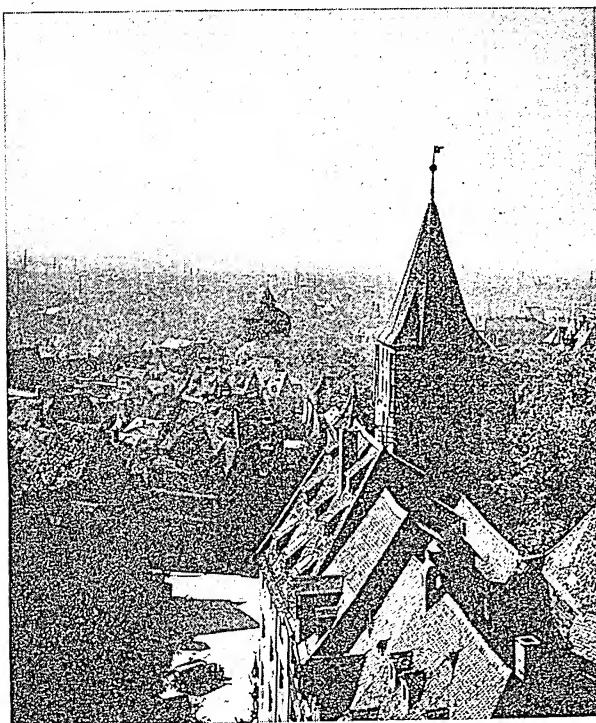
turrets, the great gateways flanked by massive towers, the irregular streets, and quaint gable-faced houses, all carry us back hundreds of years to the time when Nuremberg (German *Nürnberg*) was the gateway through which passed much of the rich goods of the East on their way to northern Germany. The old houses, whose upper stories jut out over the street, seem to be leaning toward each other in a confiding manner, and their picturesque windows and overhanging balconies whisper secrets of long ago.

Over the doorway of one of these houses appears an inscription showing that there Hans Sachs, the great poet and playwright of the 16th century, wrote

"THE HOME OF GERMAN ART"

DREAMY OLD NUREMBERG, with many of its red-roofed 15th century houses still intact, looks today much as it did five centuries ago when Albrecht Dürer sat in his studio below and drew mauve and green flourishes on the margin of Maximilian's prayer book, and wished for graver work to do. Longfellow said of lovely Nuremberg:

*Here when art was still religion, with
a simple reverent heart,
Lived and labored Albrecht Dürer, the
Evangelist of Art.*



from early in the Middle Ages, probably derived from contact with the Saracens who then ruled Spain. But the real introduction of the "Arabic" system into Europe came with the rise of commerce which followed the crusades. Then for the first time West and East were brought into continual contact, and we may consider the new system of notation as one of the many gains of Europe from the activities of the Italian merchants. The zero was now an established part of the system. The old and cumbersome Roman system was not entirely replaced, however, by the Arabic until the 16th century. (See Arithmetic.)

NUREMBERG, BAVARIA. An old South German folk-song tells us that—

*Who'er would see the German land
And know the German heart,
Needs but to go to Nuremberg,
The home of German art.*

And it is true that in this city of Bavaria we get both the old and the new land. The old city walls and

his comedies and songs at the same time that he made shoes for the citizens of Nuremberg. The quaint little Brattwurstglöcklein, where he met his neighbors, is a lean-to to a church where beer and sausages are still served. Another of the old mansions pointed out now as one of Nuremberg's most treasured relics is that in which Albrecht Dürer the painter lived. It was Dürer and his companion artists of the "Nuremberg school" who made this city "the home of German art," and here we can see many specimens of their work. But most of Dürer's paintings have been sold and one must go to Munich and Berlin to see them. At St. Sebald's Church are the Twelve Apostles, the masterpiece of Peter Vischer, Germany's greatest worker in bronze. And at that of St. Lorenz are to be seen the work of Wohlgemuth, the master of Dürer, and of Adam Krafft, the stone and wood carver. The large art museum houses many other treasures.

High above this ancient section of the city towers the old castle with its underground passages and its "chamber of horrors" in which are medieval instruments of torture, among them a reproduction of the "iron virgin"—a spike-lined, hollow figure with spike doors which were closed about its victims. The reproduction was made in 1867 after the original had been taken to Vienna in 1834 by the French.

Modern Nuremberg has a number of factories outside the old city walls, where are made many things, from great locomotives to lead pencils and wonderful dolls and toys. Population, about 410,000. **NURSING.** The art of ministering to the sick and helpless is older than medical science itself, but systematic training for this work is of comparatively recent origin. During the Middle Ages some religious organizations were especially dedicated to the care of the sick. Their members were taught simple nursing methods learned by generations of practical experience. The Sisters of Mercy is among the many religious orders today devoted to hospital work. But it was not until the pioneer efforts of Florence Nightingale that nursing was recognized as an independent technical profession (see Nightingale, Florence). In 1872 the first class of scientifically trained nurses was graduated in the United States.

Standards of nursing education and service have advanced steadily since that time. Today a girl must be a high school graduate to enter a reputable hospital nursing school (see Hospitals). She must pass a rigorous physical examination, and may undergo intelligence and aptitude tests as well. She pays tuition fees ranging from \$40 to \$300 for the three-year course, but receives board, lodging, and laundry free. She enters training as a "probationer" and must further prove her fitness for the work during a three-to five-month period before she receives the starched white cap that is the symbol of her status as a student nurse. She attends prescribed classes in such subjects as anatomy, physiology, and the basic principles of medical practise taught by physicians and surgeons on the hospital staff. She studies the techniques of nursing under graduate nurse instructors. She is on duty about eight hours each day in the hospital wards and rooms, practising the theory she has learned and becoming increasingly expert in the care of the sick. After completing the three-year course with a good record she receives a diploma in nursing.

The next step is to pass the state board examinations and be registered as a qualified nurse, entitled to write R. N. ("registered nurse") after her name. These letters represent the state's assurance to the

patient that the nurse has met its requirements for the practise of her profession. States also set up minimum standards for nursing schools.

A nurse may go into "private duty" caring for the sick in their homes or in hospitals, or she may enter the employ of a hospital, sanitarium, or similar institution. Here she may advance to a number of special posts, including those of operating-room nurse, anesthetist, dietitian, X-ray technician, orthopedic therapist, instructor, head nurse, and superintendent of nurses. She may enlist as an army or navy nurse with an officer's commission and pay. She may join the Red Cross Nursing Service or Veterans' Administration Service. Public health nursing calls many nurses to a variety of tasks. The largest number of women in this field are visiting nurses, but many rise to administrative positions. Training in nursing may also lead to a job as an assistant to a physician or dentist, as an industrial nurse, a school nurse, or a stewardess on trains or airplanes.

The better positions usually call for advanced training. An increasing number of colleges and universities have opened schools of nursing where, in addition to completing the hospital training required for a nursing diploma, students may take a year or more of supplementary work entitling them to academic degrees. Many universities also offer post-graduate courses in special branches of nursing.

TWO FEATHERED GYMNASTS



The nuthatch is an expert gymnast. He can hop head first down a tree trunk quite as easily as he can hop up it, for he is furnished with sharp claws, well adapted for holding rough bark.

The American Nurses' Association and the National League of Nursing Education, both with headquarters in New York City, have led the movement toward higher professional standards. Girls who are interested in taking training may write to one of these organizations for information and advice. These associations stress the fact that nursing is an exacting profession the chief rewards of which go to the "better than average" nurse. They stress the need for such qualities as physical stamina, emotional steadiness, alertness, tact, self reliance, and the ability to cooperate with others.

Many high schools offer classes in home nursing to prepare girls to care for members of their families (see Home Economics). The American Red Cross also conducts short courses in home nursing for adults. The Red Cross sponsors the training of Nurses' Aides who serve in hospitals as volunteers when wars or other emergencies bring a shortage of nurses. Following 80 hours of classroom and ward training, aides must give 150 hours' hospital service each year.

NUTHATCHES AND CREEPERS. Nuthatches resemble chickadees in their topsy-turvy search for the insects and grubs hidden in the bark of trees. With their sharp, curved claws they scramble busily up and down tree trunks and around branches, upside down more often than not, pausing occasionally to study a human intruder with friendly curiosity. The name nuthatch refers to their habit of forcing soft-shelled nuts into the crevices of trees, and then

hammering them open with their bills. They are smaller than English sparrows, with bluish-gray and white backs, white or reddish-brown breasts, and short, square tails. They nest in the forests of northern Canada. The nest is usually placed in a hole of a dead tree. In the winter they scatter throughout the United States, often traveling in the company of chickadees and downy woodpeckers, with whom they seem to be on the best of terms. In the northern states, where bird calls are rare in the winter, their loud, nasal *yank! yank! yank!* is a welcome sound.

The creeper is a modest little brown bird with a dull white breast. Unlike the nuthatch, it hunts for its insect food by going around tree trunks spirally from bottom to top, always keeping an upright position, and using its spiky, sharp-pointed tail for a brace, as the woodpeckers do. The common call of the creepers is a thin *screak*. They spend the summer in the evergreen forests of southern Canada and the mountains of western United States. They build their nests behind the loose bark of old trees. In the winter they spread throughout the United States.

Both the nuthatches and the creepers are Old World families, extending across the northern parts of Europe and Asia. Only four species of nuthatches and one species of creeper occur in the Western Hemisphere.

Scientific name of the nuthatch family, *Sittidae*. The white-breasted nuthatch (*Sitta carolinensis*) is an eastern species, ranging west to Manitoba and eastern Texas. The red-breasted nuthatch (*Sitta canadensis*) extends across the continent and from the upper Yukon Valley to southern California. The brown-headed nuthatch (*Sitta pusilla*) is found in the coastal pine belt of the southeastern states. The pigmy nuthatch (*Sitta pygmaea*) lives in coniferous forests of western North America and Mexico.

Scientific name of the creeper family, *Certhiidae*. The one species in the United States is *Certhia familiaris*. It is divided into five very similar subspecies, the brown creeper of the eastern states, and the Rocky Mountain, Mexican, Sierra, and California creepers of the West. The so-called "black and white creeper" is a warbler. (For illustrations in color, see Birds.)

NUTMEG AND MACE. The fragrant spice we call nutmeg is the seed of the nutmeg tree. From the fruit of this tree is also obtained mace, another popular spice which has a characteristic flavor of its own, quite unlike that of nutmeg. "The nutmegs must be able to smell the sea and the cloves see it," is a common saying. Indeed, most plantations are on the tropical islands of the Netherlands Indies, the British West Indies, and on the island of Penang off the west coast of the Malay Peninsula.

There are about 80 species of nutmeg trees and shrubs. The most common (*Myristica moschata*) is a handsome evergreen with straight trunk about 25 feet high covered with branches from base to tip. The flowers are small and yellow, with a perfume like lilies of the valley.

Nutmeg trees bloom and bear in continuous succession the year round. When a crop is ripening, the trees are bright with yellow fruit about the size and shape of pears. In the wind, the dark, glossy five-inch leaves seem lined with silver, and the air that stirs them carries away a fragrance that is indescribably sweet.

When the fruit is ripe the fleshy outer husk is removed. Preserved in syrup, it is the favorite delicacy in the Netherlands Indies. Under this outer husk is the lacy scarlet fiber known as mace. Inside this fiber in turn comes a thin shell which encases the familiar nutmeg of commerce, about an inch long and irregularly ridged.

The mace is stripped from the nuts and both mace and nuts are fire-dried and sun-dried for more than a month. At the mills the mace is finely ground. Sound nutmegs are usually exported whole to retain their flavor. Inferior nuts are ground, and the oil is extracted to make "oil of mace" or nutmeg butter.

For many years the Banda Islands in the Molucca group have been specially famous for the quality of their nutmegs and mace. This is credited to the skill and patience of the plantation workers in preparing the spices for market.

The legend that shrewd Connecticut merchants used to fashion pieces of wood to resemble nutmegs, then flavor them with the spice and sell them as genuine, is said to have originated with the Canadian humorist Thomas Haliburton, who wrote under the name of "Sam Slick."

NUTS. Many primitive peoples who had not yet learned to catch fish, hunt game, or till the soil subsisted chiefly on roots, berries, and nuts. Of these, nuts were the most concentrated and nourishing, for they are especially rich in oil and protein. Furthermore, the nut meats were preserved inside airtight shells and could be kept to be eaten through the long cold winters when other foods were unavailable.

Today only a few nuts are of much importance as food, but a constantly growing number provide materials useful in industry. A true nut has a hard shell; it does not split open when ripe; and the kernel or meat is in one piece. *Walnuts, pecans, butternuts, hazelnuts or filberts, hickory nuts, beechnuts, acorns and chestnuts* are among the true nuts in the botanical sense (see Walnut; Pecan; Butternut; Hazel; Hickory; Beech; Oak; Chestnut). But in the popular sense, many other fruits and seeds are called nuts, including the *peanut* which belongs to the pea family; the *almond* and the *coconut* which are drupes or stone fruits (see Peanut; Almond; Coconut Palm).

One of the most delicious is the *Brazil nut* which grows in Brazil and other parts of tropical South America and in French Guiana. These three-sided nuts grow in clusters of from 14 to 28, tightly packed inside a great hard round shell, the color of a coconut and as big as a man's head. When the nut is ripe, it crashes to the ground, and since the trees are a hundred or more feet high, it is best to stay out of range. Oil from the Brazil nut has medicinal properties, and is also used for lubrication and lighting; the husk provides a kind of oakum for calking ships.

Pistachio nuts are oily and have a distinctive aromatic flavor. Their pale green kernels are enclosed in a thin two-part shell. They are seeds of a tree native to Asia Minor.

The queer kidney-shaped *cashews* have long been very popular. Cashew trees flourish on land unfit for

farming and where other trees could not exist. India is the chief producer and processor of cashews. In addition to its own large crop, India imports cashews from South Africa and Portuguese East Africa, roasts them in oil and salts them, then ships 84 per cent to the United States, its chief customer. The shell of the cashew is a valuable source of oil used in swift-spinning engine mechanisms, such as magneto armatures.

Tung nuts of China, now raised extensively in Florida, contain an oil used in paint and varnish manufacture (see *Paints and Varnishes*). From the meat of west Africa's *palm nuts* is expressed an oil used in soapmaking; the endosperm is a source of oil for coloring imitation butter. The edible *coihune nut*, from a palm of Honduras, also supplies a lather-producing oil. When the soap oil shortage occurred during the second World War, Brazil's rich-lathering *babassu nut*, hardest nut in the world, became extremely important in soap manufacture. Other sources of oil are the *dika nut*, which is the seed of a west African mango tree, and the *pine nuts* of Europe and America (including the edible *piñon nut* of southwestern United States.)

The *candlenut*, found throughout the tropics, is one of the most versatile of all nuts. It can be lighted and used like a candle. A purgative oil can be squeezed from its raw meat. If roasted, it is a good food for men and cattle. *Gru-gru nuts* of South America and the West Indies yield a violet-scented oil used in soapmaking. Necklaces made of them keep their fragrance for many years. Brazil's *cumara nut* supplies an oily perfume.

Buttons are made from the "vegetable ivory" obtained by drying the kernels of the *tagua* or *corozo nut* and of the *coquilla nut*, both of South America. This vegetable ivory is exceedingly hard and can be sawed, carved, turned on a lathe, colored, and polished (see

Buttons). Oil from the fresh kernels is a good substitute for coconut oil in soapmaking.

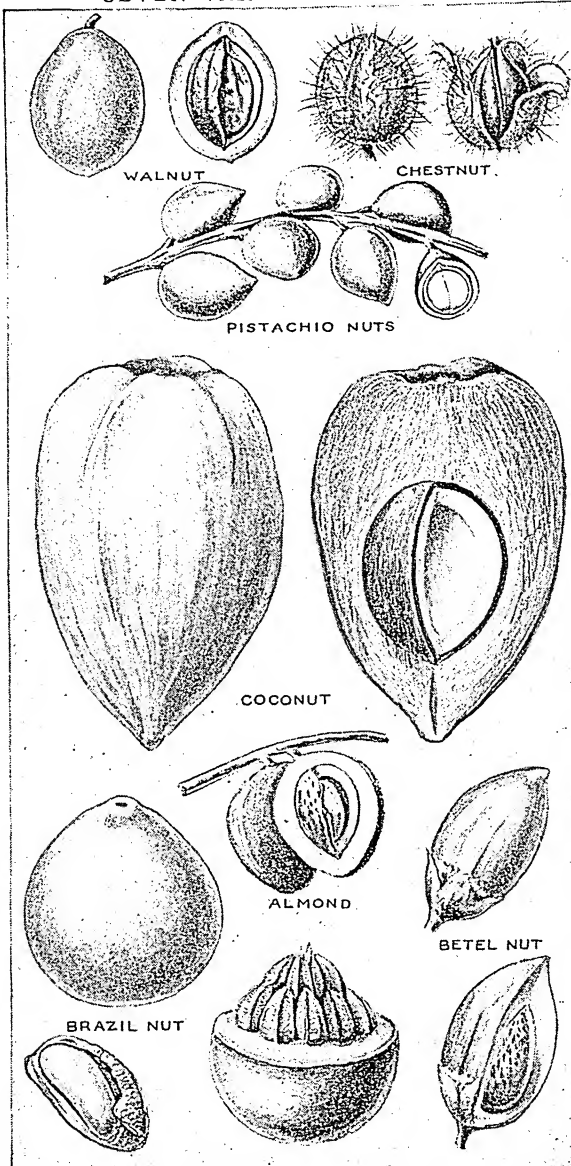
The Chinese *litchi nut* has inside its brittle shell a meat that resembles a strawberry when fresh and a raisin when dried. *Betel nuts* are chewed as a narcotic by East Indians (see *Betel*). *Cola* or *kola nuts*, native to Africa and cultivated elsewhere in the tropics, contain much caffeine and are used as a basic ingredient in our familiar cola drinks.

A comparative newcomer to the American market is the *macadamia nut*. Native to Australia and now grown commercially in Hawaii, the macadamia has an individual and delightful flavor.

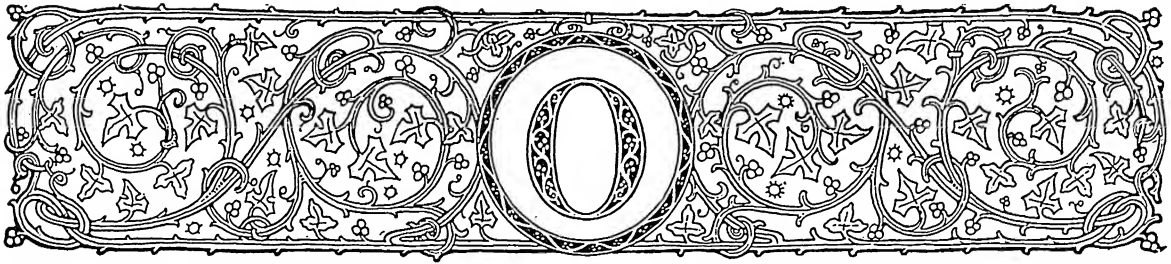
NYMPHS. To the imaginative Greeks of ancient times all the seas, streams, fountains, caves, hills, and woods seemed peopled with divinities. The fair young goddesses who presided over various parts of the world of Nature were called nymphs. In the limpid springs, fountains, brooks, rivers, and lakes dwelt the Naiads, beautiful water nymphs. The Oceanides (daughters of Oceanus) were nymphs of the great sea which was believed to surround the whole earth. The Nereids were the nymphs of the Mediterranean; clad in their flowing green robes, they might be seen dancing over the waves. Of their number was Thetis, the mother of Achilles. The Oreads, or mountain nymphs, represented as tall graceful maidens, were the constant companions of Artemis, the huntress goddess.

The unfortunate Echo was an Oread. The Napaeas, the shiest of the nymphs, dwelt in the valleys. Every tree was believed to have its own nymph, called a Dryad or Hamadryad, who was born when the tree began to grow, dwelt in it, suffered if it was mutilated, and sickened and died when the tree perished. Although the Dryads were subject to death, like mortals, they remained young while they lived.

SEVEN VARIETIES OF NUTS



These nuts are shown whole and also cut open. Notice the many Brazil nuts packed together inside an outer shell.



OAK. Long ago great forests of oak covered whole sections of England and central Europe, and although they have been gradually cleared with the progress of civilization, the hardy oak still remains among the most important of trees in France, Germany, and southern Russia, supplying quantities of lumber which is universally useful. In the American forests we encounter a bewildering variety of noble oaks which vary widely in size, color of bark, and leaf forms. There are more than 200 species of the oak distributed over the temperate parts of North America, Europe, Asia, and northern Africa, a few species extending into the tropical Andes, the Himalayas, the Philippine Islands, and Borneo.

All oaks bear acorns, a fruit peculiar to these trees. The Indians of New England and farther south ate the acorns of several species of white oak. Pacific Coast Indians still eat the sweet acorns of the California white oak, baking, shelling, and grinding them into a coarse meal from which they make bread. Hogs feed upon acorns, and squirrels and some birds store them away for winter food.

About 50 species of the genus oak are native to America, including some of the finest forest trees of the United States. Among the best known species is the white oak, a stately graceful tree, reaching a height of 70 to 100 feet. It is covered with large deeply lobed leaves, light green above and whitish beneath. In autumn the foliage turns deep violet and clings to the tree throughout the winter, falling when the new leaves appear. Such clinging leaves are characteristic of many of the oaks. The trunk of the white oak, which often reaches a diameter of three to four feet, is covered with whitish furrowed bark, which gives the tree its name. Its large egg-shaped acorns, set in cups, grow singly or in pairs on short stalks. The tree attains its greatest perfec-

tion in the forest, but on account of its spreading top it is highly valued also as a shade tree.

The bur or pin oak is another well known and valuable American species. This is a hardy beautiful tree, often towering to a height of 150 feet, though the average height is about 75 feet.

Its deep green leaves are very large, sometimes measuring from 10 inches to a foot in length, deeply lobed at the lower part and rounded at the apex. It bears exceptionally large acorns, set in rough cups with a noticeable fringe about the edge. The bark is brownish-gray and furrowed. The bur oak is comparatively rare east of the Alleghenies, but it is found from Pennsylvania to Montana and south to Texas.

The red oak is perhaps the most beautiful of the American species, presenting a picturesque appearance in all seasons.

The round solid top is covered with large sharply lobed leaves, which are pink and furry in the spring, green in summer, and deep purple-red in autumn. The bark is dark brown, thick, and furrowed. The red oak also bears large acorns set in shallow cups.

The chestnut oak (also called the chinquapin), although possessing the main characteristics of the oak family, is conspicuous on account of its chestnut-like leaves; these are serrated or "saw-toothed" instead of deeply lobed. The tree is tall and stately, with stout trunk and limbs. (*See Chinquapin.*)

The live oak is a beautiful Southern form of smaller size but sometimes rising to a height of 60 feet. The branches are spreading and graceful, and are covered with small glossy evergreen foliage. It is rarely found more than 50 or 60 miles inland from the Gulf of Mexico.

The well known British oak is the largest and most valuable of all the oak trees and is celebrated in myth and history. This tree is a veritable giant, with

THE BRAVE OLD OAK



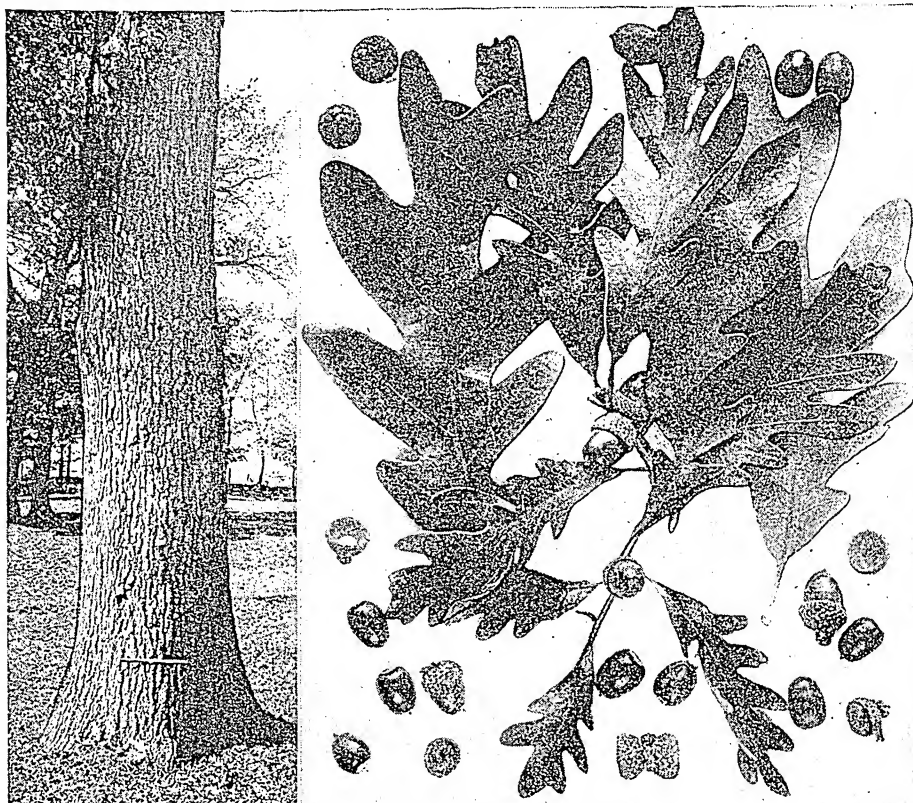
This stately monarch of the greenwood is one of the most important trees in all temperate lands.

sturdy limbs and enormous girth. The peculiar zig-zag growth of the limbs in older trees gives them a twisted appearance which gives rise to the phrase, "the gnarled British oak," and adds to the picturesque

manufacture. The bark being rich in tannin is used for tanning leather. The timber of the white oak is adapted to the same purposes as that of the preceding trees, though it is slightly inferior. The

Southern live oak produces strong yellow wood which is difficult to work; it is highly valued for shipbuilding, being very durable under water. The timber of the red oak has little commercial value, being very porous, but it is useful for making cask staves; its bark also is used for tanning. The chestnut oak yields good timber.

The galls or "gall-nuts" so frequently found on oaks are produced by gall-flies, which lay their eggs in the tissues of the trees. The tissues swell up at the point of puncture and form firm nutlike structures inside of which the young of the insects develop to maturity. Each kind of gall-fly produces a different kind of gall, the ones commonly responsible being wasps



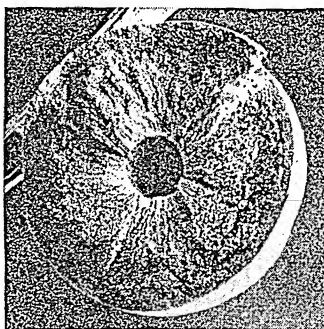
This picture shows the furrowed bark of the White Oak and the serrated leaf, with its many fingers, characteristic of all oaks. The acorns, singly or in pairs, grow from the stems. They are held fast in their cuplike husks until ripe.

appearance. This kingly tree lives to a great age, and some fine specimens which are still standing in England date back to the Anglo-Saxon period. This species is liberally scattered over Europe. It is not a native to America, but is gradually being introduced and may be found along the streets, in the parks, and in planted forests.

The timber of the oaks varies greatly from species to species. The British oak is of superior commercial value, the heart wood being tough, hard, close grained, and comparatively easy to work. It excels most wood in durability, defying drought and moisture alike, and is practically indestructible under cover. The sapwood is less durable but is highly valued also. The bur oak is one of the most valuable timber trees in North America, its strong durable wood ranking next to that of the British oak. It is used extensively for shipbuilding and

of the group *Cynipideae*. Oak galls are rich in tannic acid used in making ink and for the preparation of leather. Those still containing the insect are best.

SECTION OF AN OAK GALL



You can see the hole in which the young gall-fly grew up.

Scientific name of the British oak, *Quercus robur*. The white oak is *Quercus alba*; its range is from Maine to Minnesota and southward, flourishing best on the slopes of the Alleghenies. Bur oak is *Quercus macrocarpa*; range from Pennsylvania to Montana and south to Texas, but comparatively rare east of the Alleghenies. Live oak, *Quercus virginiana* (also known as *Quercus virens*); range throughout the Southern states. Red oak, *Quercus rubra*; range from Maine to Minnesota and southward. Chestnut oak, *Quercus acuminata*; range from Vermont to Alabama and westward.

OAKLAND, CALIF. Commanding the mainland rim of the great landlocked harbor of San Francisco Bay, busy Oakland is California's third largest city. Several transcontinental railroads, a network of highways, and transcontinental airlines bring the riches of the interior to this great port and manu-

facturing center. Low-cost transportation for its products is provided by the many shipping lines that use its harbor. Fleets of ferries and the San Francisco-Oakland Bay Bridge connect it with San Francisco, five miles west across the bay. A tunnel through the Berkeley Hills speeds motor traffic eastward.

Seven neighboring East Bay communities—Albany, Berkeley (seat of the University of California), Emeryville, Piedmont, Alameda (on an island just off shore), San Leandro, and Hayward—turn to Oakland as their chief shopping center. Many San Francisco businessmen and office workers make their homes here, drawn by the spacious residential neighborhoods on the gently sloping hills and its great system of parks and playgrounds. Among its beauty spots are Lake Merritt, a 155-acre salt-water lake, bordered by Lakeside and Peralta parks; the Heights, a wooded park once the home of the poet Joaquin Miller; and Sequoia Park, with the Oakland Zoo. Skyline Drive, rimming the hills, offers a magnificent view. Mills College is the oldest women's college in the West.

Leading manufactures include automobiles, electrical equipment, glass, yeast, soap, feed, beer, wine, and chemicals; the chief industries are lumber milling and fruit and meat packing.

Once part of a Spanish crown grant to Luis Maria Peralta, the city was chartered in 1854 and named for its stand of *encinas*, California live oaks. Population (1940 census), 302,163.

OATS. "A grain which in England is generally given to horses, but in Scotland supports the people." This is the definition of oats given in the dictionary written in the 18th century by Dr. Samuel Johnson. "True enough," was a Scotchman's ready reply to this gibe, "and where will you find such fine horses as in England, or such fine men as in Scotland?" Oats indeed are valuable as muscle builders. The oat grain contains more crude protein than does corn, and exceeds wheat and nearly equals corn in fat content.

The world's production of oats approaches that of corn and is about equal to the wheat crop. The United States in some years produces nearly one and a half billion bushels, one-third to one-fourth of the total. Cultivation is like that of wheat. From two to four bushels are sowed to the acre, the rate being smaller if drilling is practised than with broadcasting, and the average acre yields from 20 to 40 bushels. Oats will thrive on poorer soil and in wetter, colder climates than other grains, hardy varieties being grown almost up to the Arctic Circle. In the bleak climate of northern Scotland, Alaska, Russia, and Siberia, oats are a staple food crop. Common northern oats cannot be successfully

raised in warm regions such as the countries bordering the Mediterranean, which grow red oats instead.

The wild oat, considered by some to be the ancestor of common oats, is distinguished by long reddish-brown hairs at the base of the glume or scale protecting the kernel, the long twisted and bent "awns," or spikes at the tip of the grain, the closely covered and distinctly articulated kernels, and delayed germination. The cultivated variety originated apparently in central Europe, and probably was not known to the ancient Egyptians, Hebrews, Greeks, and Romans. Oats were first known as "pillcorn" in England.

Man consumes large quantities of oats in the form of rolled oats or oatmeal, and they are used as feed for live stock, particularly horses. Sprouted oats make a fine green feed for poultry during the winter months. Oats are grown also for pasture or for hay; wild varieties, common on the Pacific coast, are often harvested for hay. Oat straw is fed to stock, used for stock bedding and returned to the land, or used to make paper, for packing, and for stuffing mattresses.

Many varieties of oats are cultivated commercially. They differ principally in the form, color, or thickness of the grain, in the length of the straw, and in the time needed for ripening. All varieties of oats are hardy, and are practically free from insect pests or plant diseases except rust and loose and covered smuts. The large annual loss from smut can be prevented almost wholly by treating the seed. Plant breeders have developed varieties which are highly resistant to or immune from rust or smut, besides being productive early. Because of shortness of the straw, these varieties are not easily lodged—that is, beaten down from the proper vertical position.

The oat is a cereal grass of the genus *Avena*. Wheat, rye, and barley are members of one subdivision of the grass family which bear their seeds in spikes; oats, however, stand alone, the grain being borne in a panicle, a branching head having separate kernels. There are two main classes of common oats—the spreading oats with a panicle branching in all direc-

tions, and the side, horse-mane, or banner oats, with the kernels hanging on branches extending from only one side of the stem. An interesting kind is the so-called "animated" oat (*Avena sterilis*) with a twisted awn which absorbs moisture in wet weather and untwists, moving the grain.

Scientific name of common oat, *Avena sativa*; red oat, *Avena byzantina*; side oat, *Avena sativa orientalis*. The common wild oat is *Avena fatua*; bristle-pointed wild oat, *Avena strigosa*. The short oat, *Avena brevis*, is grown in mountainous localities in Europe.

THE "OATMEAL" PLANT



This variety of Oats—the "Red Rust-proof"—is immune to rust disease and thrives in cold, moist climates.

LITTLE TALKS ON GREAT THINGS *by Arthur Mee*

OBEDIENCE

WE LEARN to rule by learning to obey. One of the wisest sayings of one of the wisest men was that we learn to command Nature by learning to obey her, and the progress of the world has proved it true. If we would have power, we must first obey.

Of all the things we learn, this is the first; we could not live at all without obedience. There are creatures born into the world with an instinct that is almost knowledge, by which they do the right thing the instant they begin to move; but no child was ever born like that. We are helpless from the beginning; for years we look upon the world with wonder but without understanding, and we owe our safety, our happiness, our lives, to our obedience in those days to those who know better than we.

We must not allow ourselves to be led astray into thinking that obedience is something to be ashamed of. Nothing can exist without it; it is the only law by which a house or a business or a state can be maintained. It runs through the life of the nation. We must obey those in authority in our homes, and they obey the laws passed for us all. Not even the President is outside obedience, for he obeys the laws by which he holds his power, and he would be impeached and cease to be President if he disobeyed the clear law of the land.

Nothing else is possible either in war or in peace; we must trust the men we elect to govern us. We cannot all have equal knowledge. We set this man to find out that, that man to find out this, and then we act accordingly. Obedience is simply the way in which we recognize that knowledge is power. If a hundred men want to go to a certain place, and one man knows the way, the ninety-nine follow him. It is the quickest way of getting there. We are learning that the lives of all of us are like a great machine, of which we are separate parts. We call the machine Society. If some little part breaks down, Society is hindered just a little; if a big part breaks down, Society is hindered more; if something tremendous happens, like a nation-wide strike of railwaymen or engineers, Society seems to be breaking down in a hundred ways. Obedience is the recognition of these things.

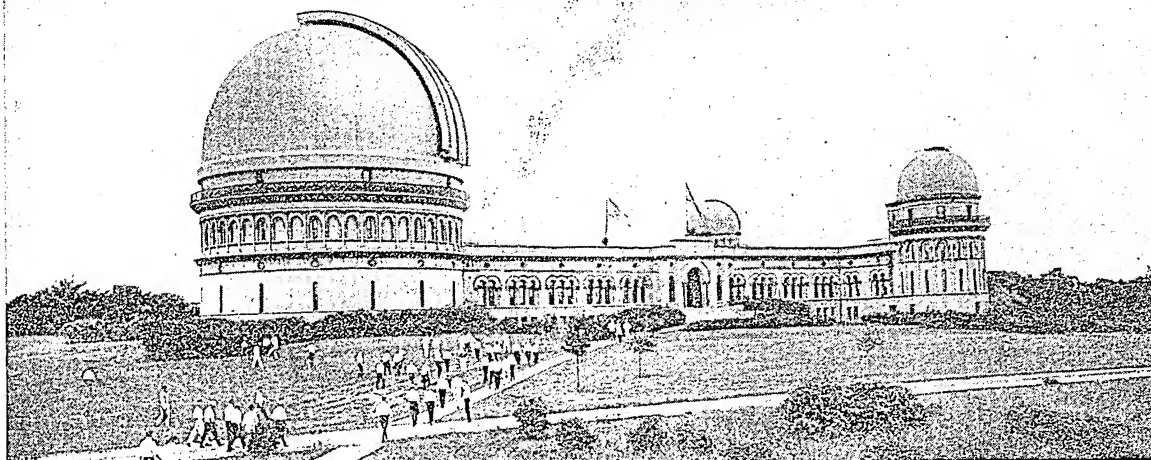
We must be ready to serve in the place we are best fitted to fill. If the best thing we can

do is to go to Congress, let us go to Congress; if we are at our best in sowing potatoes, let us sow potatoes. There is no future for those who are ashamed of service. He who does a thing best will surely come to control it, and those who watch him and obey him will surely learn his ways. We need not be ashamed to take our place, or be afraid of those above us. There is room in Society for everyone, as there is room in a body for all its parts. It was Michelangelo who thought out the dome of St. Peter's, who saw in his great imagination, as he walked about Rome, that noble edifice up there; but his dome would have come clattering down if the men who laid the stones and climbed the ladders and drove in the nails had not worked well.

It is said that a telegraph operator at Delhi saved India in the great Sepoy mutiny of 1857. He kept his head and sent his last message through: "Native troops in rebellion, murdering Europeans; all arms in their possession." He was obedient to his highest sense of duty, and he obeyed his orders whatever the hazard might be. There was a boy who was told by his father to meet him at twelve o'clock on London Bridge, and to wait till his father came. The father forgot the appointment, and as the boy did not come home, he went back and found the little man still waiting at midnight on London Bridge. He believed in his father and trusted him, and he lived to be one of the generals who saved India when the telegraph operator at Delhi sent warning. He was Henry Havelock.

There was a courtier in Persia who was talking with the Shah when a scorpion bit him. He did not flinch, and made no sign, and the king, hearing of it afterwards, sent for him. "It is an honor to talk with such a king," said the man, "and I would not allow a scorpion to break our conversation. Moreover, if I could not bear the sting of a scorpion, how could I meet the peril of the sword?" If it is an honor for a man to talk with such a king, it is an honor for a king to talk with such a man.

To know the right thing and to do it, to love truth and to obey it, to control our lives so that in all things others may have faith in us—these will bring us sovereign power, and, through obedience, lead us to command.

LOOKOUT POSTS *for* STUDYING *the* STARS

This is the Famous Yerkes Observatory of the University of Chicago at Williams Bay, Wisconsin

OBSERVATORY. The first observatories were the ancient temple towers on the banks of the Tigris and Euphrates rivers, where the early Chaldean priests sought to penetrate the mysteries of the heavens to fix the dates of their religious ceremonies. A modern observatory with its mosquelike domes reminds us of those earliest temple-observatories, but the dome is simply a roof for the huge telescope—sometimes 60 feet long—with which the astronomer studies the heavenly bodies.

Setting the telescope for a night's work is an interesting operation. First the astronomer touches a button or lever which by means of electric motors wheels the big instrument around to the part of the sky which he wishes to study. Another lever shifts into position the dome itself, which rests on rollers, and the shutter is thrown back, opening up the slit through which we see the heavens. In the old observatories step-ladders were used to bring the observer to the eye-piece, but nowadays motors move the floor itself up or down.

To keep the instrument pointed to the star we are studying we must constantly move the telescope. This is owing to the rotation of the earth, which makes the stars appear to rise and set in the same way the sun does. But we no longer move our telescope by hand; we simply turn on a clockwork which causes the telescope to follow the star.

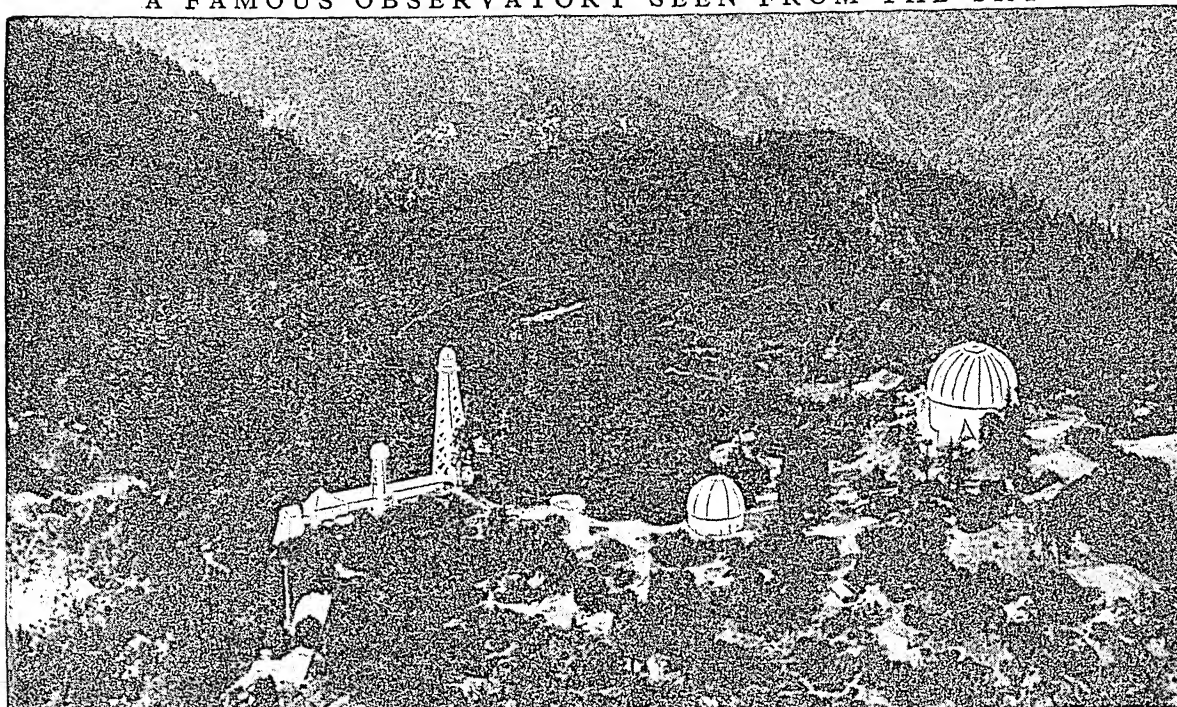
The combined stand and mechanism by which this is possible is known as an equatorial mounting. The telescope is fastened to a graduated circle, called the declination circle. The axis of this circle is attached at right angles to the axis of another graduated circle called the hour circle. The hour-circle axis is

pointed to the pole in the heavens, and the hour circle is parallel to the celestial equator. The result of this combination of axes is a universal joint, making it possible to point the telescope at any point in the sky.

We know that a watchmaker has a hard task to make an instrument that will keep accurate time to small fractions of a second. But consider that the clockwork of the telescope must be strong enough to move an instrument weighing 20 or more tons, and delicate enough to permit the astronomer to adjust it by hand so as to keep a spider thread $\frac{1}{8000}$ of an inch in diameter constantly cutting in two a star image that is $\frac{1}{2500}$ of an inch in diameter. That is one reason why modern observatories cost hundreds of thousands of dollars to build.

An important function of observatories is to determine correct time. In the United States this is done by the Naval Observatory at Washington, which sends out several times a day by radio and telegraph time signals accurate to within a few hundredths of a second. A similar service is performed by the Royal Observatory at Greenwich, England. This time service is vitally important to navigators, for they determine their longitude by comparing their local time as learned by sun observations with the time of some fixed place such as Washington or Greenwich. The Naval Observatory also publishes for navigators the 'American Ephemeris and Nautical Almanac', which is the standard guide in America to the movements of the sun, moon, stars, and planets. In many observatories, special telescopes which rotate only in a north and south plane are used for making time-fixing observations. Telescopes mounted in this way are known as *transit instruments*.

A FAMOUS OBSERVATORY SEEN FROM THE SKY



This is the first airplane photograph of the Mount Wilson Solar Observatory, about 16 miles from Pasadena, Calif. This station is the home of the largest reflecting telescope in the world, with a diameter of 100 inches. There is also a reflecting telescope of 60 inches, both of these being used for the study of the stars. The two tower observatories at the left are used for the study of the sun and conditions in the solar atmosphere.

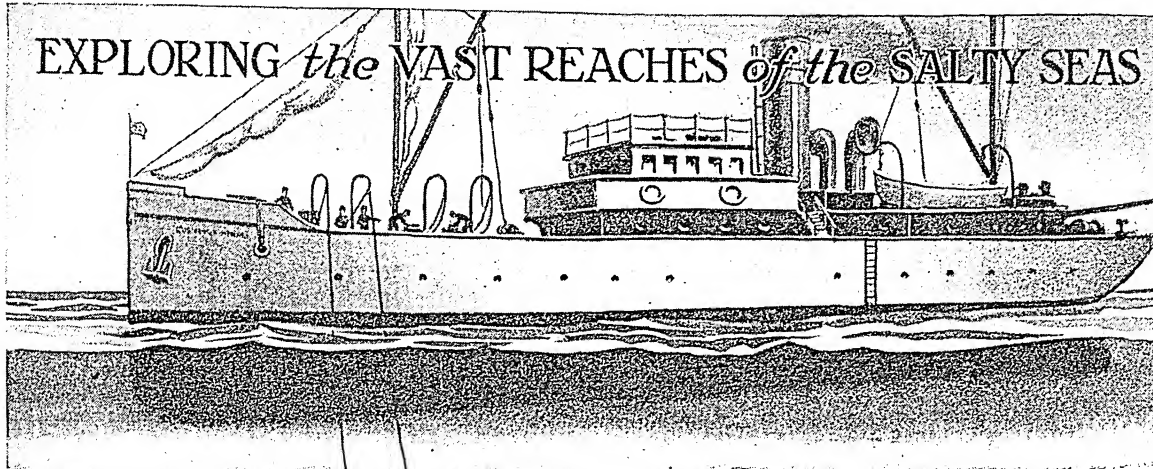
If we visit a great modern observatory, we find that besides the telescopes there are a great many other complex and interesting instruments. One of the most important of these is the spectroscope, by which we learn what the sun and stars are made of (see Spectrum and Spectroscope). Another interesting instrument is the spectroheliograph, by which astronomers can photograph parts of the sun that could formerly be seen only at the time of an eclipse.

In our visit to the observatory we are sure to find the astronomers spending more time at their desks than in the operation of their instruments. That is because a majority of the actual observations are now made with photographic attachments. With a photographic plate it is often possible to get results in a few minutes that would require hours to work out with observations by the eye. The camera is attached at the eye end of the instrument, and the delicate clockwork keeps the great tube pointed at the star or group of stars as long as it is necessary to get a full exposure. For several years the great observatories of the world have been engaged in a coöperative project of photographing the whole heavens. This chart of the sky, when it is finished, will comprise more than 20,000 separate photographs. A study of such photographs is of the greatest importance in astronomical work, and many new stars have been found by this means.

The most important national observatories besides those of the United States are those at Greenwich

(England), Paris (France), Pulkowa (Russia), Potsdam (Germany) and Córdoba (Argentina). Several important observatories are in South Africa, including those maintained by Harvard and Yale universities. Noted American observatories include Harvard University's observatory (Cambridge, Mass.); the Yerkes observatory of the University of Chicago (Williams Bay, Wis.); the Mount Wilson observatory of the Carnegie Institution of Washington (Pasadena, Calif.); the Lowell observatory (Flagstaff, Ariz.); the Perkins observatory of Ohio Wesleyan University (Delaware, Ohio); the Lick observatory of the University of California (Mount Hamilton, Calif.); and the Astrophysical observatory of the Smithsonian Institution (Washington, D. C.). The Yerkes observatory is notable for its 40-inch refracting telescope, the largest of its type in the world; Lick observatory has a 36-inch refractor. Mount Wilson's 100-inch reflecting telescope, long the largest of its kind, is surpassed by the 200-inch reflector being built for the California Institute of Technology. Other reflectors are the 84½-inch instrument being made for the University of Michigan; the 82-inch instrument of the McDonald observatory of the universities of Texas and Chicago, near Fort Davis, Tex.; and the 69-inch instrument of the Perkins observatory of Ohio Wesleyan University. In Canada are the 74-inch telescope of the David Dunlap observatory at Toronto, and the 72-inch telescope of the Dominion of Canada Astrophysical observatory at Victoria. (See also Astronomy; Telescope.)

EXPLORING *the* VAST REACHES *of the* SALTY SEAS

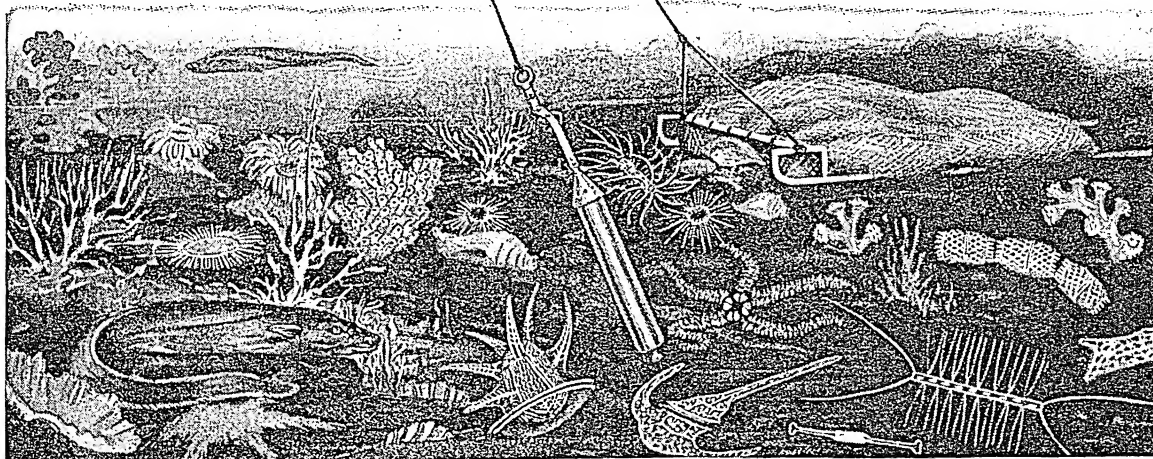


OCEAN. The oceans are gathered into five great basins, and together they cover about 72 per cent of the earth's surface. If the sea were 2,000 feet deeper, and the land 2,000 feet lower, there would be nothing left on earth but a few hilltops in a vast wilderness of water, and whoever would live would have to be a sailor.

It is quite certain that most lands have been covered by the sea in past times, and some large areas have been submerged repeatedly. On the other hand we have no knowledge that any part of the deep ocean ever was land; or that any existing land ever was beneath the deep ocean. Most of the limestone, sandstone, and shales of land areas were deposited as sediment on the bottom of shallow seas. Chalk, such as

How mighty are the vast deeps that cover three-fourths of our Earth's surface! And what wonders of teeming life have inhabited and still inhabit their abysmal depths! In countless ways Oceans are the friends and servants of mankind. that found in England, Texas, and Kansas, was deposited on the bed of a sea, and is made up of the shells of tiny creatures of the sea, billions and billions of them dying from generation to generation and sinking to the ocean bed to form deposits of chalk. We know that during several periods of the earth's history large parts of North America were covered by the ocean and some people have believed that the site of the Atlantic Ocean once was occupied by a continent, which they called Atlantis.

The seas as we know them, with their present coasts, belong to the modern era of the earth's history. Of the five great oceans, the Pacific Ocean is the largest. It has an area of more than 60,000,000 square miles, and covers a larger surface of the globe than all the continents combined. In some parts it is over 35,000 feet deep. The Atlantic Ocean is smaller than the Pacific (34,000,000 square miles), and the Indian Ocean is about half as large as the Atlantic



Here is one of the ways in which we learn about the teeming life on the floor of the great oceans. Purse nets pick up specimens of animals and plants, and ingenious plumb lines bring samples of soil and water from the depths.

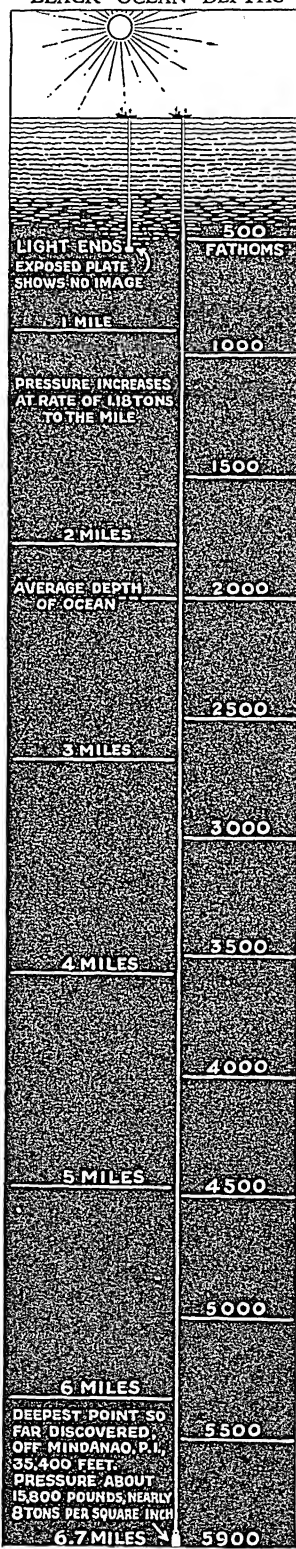
(18,000,000 square miles). Both the Arctic and Antarctic (or Great Southern) oceans are much smaller, but the figures are uncertain, as large areas are unexplored. These oceans are largely frozen over in winter and the ice melts but partially in summer. The width of the Pacific is 9,400 nautical miles between Panama and the Philippines; while the distance across the Atlantic, between the African coast and the La Plata River is 3,700 miles.

The waters of these oceans cover nearly three-fourths of the earth's surface, or about 140,000,000 square miles; and their volume is 14 times that of all the land above sea-level. Their average depth is about 12,000 feet. The whole volume of water in the oceans, if it were to be frozen into one ball, would form a globe 850 miles in diameter. There are oceanic areas as large as the United States where no soundings have been taken; but we know that the beds of the oceans are not so varied as the surface of the continents, though they have their mountain ranges, elevated plateaus, and vast lowland plains. They are, for the most part, without the hills and valleys which characterize the land.

All the water in all the seas is salt, the salt in it being precisely the same salt as we use in our food. Mixed with it are numerous other minerals. In a gallon of sea-water there is a little more than a quarter of a pound of common salt. The water of our Great Salt Lake and the Dead Sea of Palestine contains much more salt, gallon for gallon. In every cubic mile of sea-water there is something like 100,000,000 tons of salt—some of it washed out of the land by the streams and rivers that flow forever to the sea, some of it there probably from the very beginning. The rivers are dumping salt into the ocean at the rate of over 158 million tons annually, so that the briny deep is increasing in brininess all the time. If the salt could all be extracted from the sea and dried, there would be enough to make a layer more than 100 feet deep over the whole earth.

The water of the oceans contains most of the mineral substances in the crust of the earth. Even when we cannot extract them we find them in seaweeds and sea creatures that have taken them from the sea. Silver has

BLACK OCEAN DEPTHS



If you could drop Mt. Everest into the deepest part of the ocean, it would not reach within a mile of the surface.

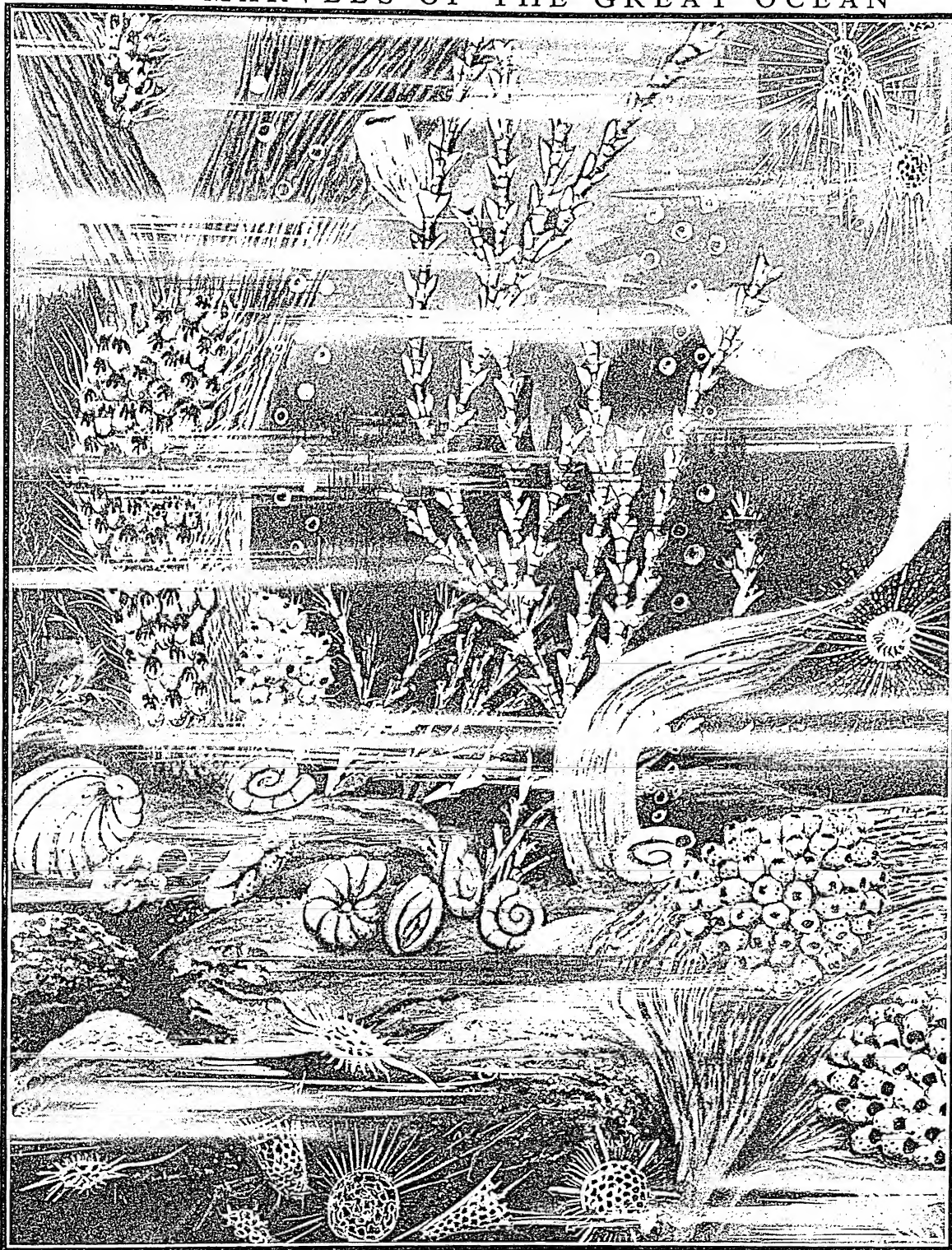
been extracted from the sea by the bottoms of ships sheathed with copper, and it has been estimated that there must be many tons of silver in the sea. Many companies have actually been formed to try to obtain gold from seawater, but none of them have succeeded.


Even the depths of the sea have not been too dark and inaccessible for scientific exploring, and we know much of the life of the ocean bottom. We know it because there are men who spend their lives exploring the lengths and breadths of the mighty oceans. Looking at it from the shore, the sea does not seem to be very mysterious, and a child would hardly guess that the wide blue surface of foaming water conceals so great a variety of life. Marvelous indeed is the thought of life miles down in the sea, when we remember that the creatures living there are under pressure equal to that a man would bear if he were lying under 20 railway trains loaded with iron bars.

Ocean depths defy man. Man has risen high into the air, has cut out vast cities in the coal under the surface of the earth, but the deep sea checks him; the pressure of the waters is greater than the human frame can bear. Even with William Beebe's metal globe called the "bathysphere," which is stout enough to withstand the crushing pressure, we are limited to a depth of a few hundred fathoms. The boldest diver in the ordinary diving suit would not dare to descend more than a few hundred feet beneath the surface, and even this seemingly short journey into the water-world is full of perils for man. The first diver to go down 90 yards into the sea was protected with a metal helmet and a metal breast-plate, and air was pumped down to him by six sailors, but he had a terrible struggle to get back alive. The undercurrent of the bottom of the sea swung his life-line about and entangled it, so that he could not reach the surface, and for 20 minutes he fought for his life in the ooze and darkness. Then, after 90 minutes of struggle, they raised him slowly to the top again.

Imagine the weight of the Atlantic Ocean at the depth of a mile or two! With 2½ miles of water over their heads human beings would be crushed, if let down suddenly. On each square inch

TINY MARVELS OF THE GREAT OCEAN



 This looks like a photograph of strange monsters. Actually, it shows what the microscope revealed in a rocky pool, in a spot only as large as the small square at the left. Most of these creatures are so small that the naked eye could not perceive them, but a powerful microscope reveals them in all their fascination. With the aid of modern instruments we are gradually learning more and more about all the strange forms of animal and plant life in the

seas, and to read the story of evolution—a story which began ages ago in ocean waters. It is from primitive creatures such as these that scientists are slowly putting together the story of how higher forms came into existence, for many of them are the present-day descendants, practically unaltered in forms and habits, of the first forms in which organized animal and plant life appeared on our planet. Truly, the ocean is a fascinating book of life, when even a drop holds such wonders as these.

of their bodies there would be a pressure of over 2½ tons. But it is man's way to overcome difficulties like this, and where he cannot go himself he sends his scientific messengers in the form of instruments.

Even with these, however, our knowledge of ocean depths has been built up slowly and in curious ways. One of the first ocean explorers filled a glass tube with air, sealed it, wrapped it in thick flannel, and put it in a copper tube, making tiny holes at the top and bottom of the tube so that water might enter. Then he sent the tube, filled with air, down 12,000 feet. When it came up the thick copper tube was pressed flat, and the glass was reduced to powder. That was the experiment which revealed the fact that the pressure on every square inch of the body of a creature at that depth is more than 20 times greater than the pressure in the average locomotive boiler.

From all this experience men for a long time believed that there could be no life down in the ocean depths. No sunlight ever reaches more than a few hundred feet below the surface, and where there was no sunlight, it was argued, there could be no plant life. Where there was no plant life there could be no animal life, and so the great floor of the ocean, it was reasoned, must be a desolate region of emptiness and death. But then a strange thing happened. A telegraph cable in the Mediterranean broke at a depth of more than 7,000 feet and when the broken ends were raised it was found that the cable was overgrown with an astounding variety of living creatures. It was certain that they had been alive in the dark and icy cold of the sea bottom, with tons of water bearing down upon them.

Investigating the Great Depths

Now men have devised new means of reaching the ocean depths. They let down nets and iron hooks; instruments for measuring the temperature of the water; and bottles which open when they touch the bottom, fill with water there, and then close so that water at higher levels cannot enter. They make great nets which touch the bottom of the sea and close up tightly as soon as they are raised above the floor. In them are brought up from the bottom countless living creatures from a realm unseen by man.

And what men find is that in this kingdom of the deep sea—a kingdom of darkness and almost freezing cold—is a great variety of life. The floor of the sea, it may be said, is like a living garden planted by Nature herself. Blind crablike forms crawl in and out of the strange undergrowth, but other creatures there are that not only have eyes, but shine with a soft dull light. There are, indeed, myriads of tiny living lamps that swim about illuminating the ocean bed.

Explorers declare that on some parts of the floor of the sea there are millions of little creatures that shine like glow-lamps, and the discoveries that have been made in this direction are among the most interesting of all. When we make light by burning coal or gas or chemicals or by passing a current of

electricity through the filaments of a lamp, we waste most of the energy in heat; only a little of it is transformed into light. But the phosphorescent light of deep-sea creatures—like the light of the firefly—is made without waste of heat. It is pure light, and a huge fortune awaits the man who can discover the way to make light in this way. Even some sharks are able to light up their paths through the deep sea with a white and heatless radiance. Certain glands in their skin give out a sticky substance, and it is this substance that makes them shapes of living light. It is doubtful, however, if the shark ever penetrates to the deep ocean beds, and it is the deep-sea animals which are most phosphorescent.

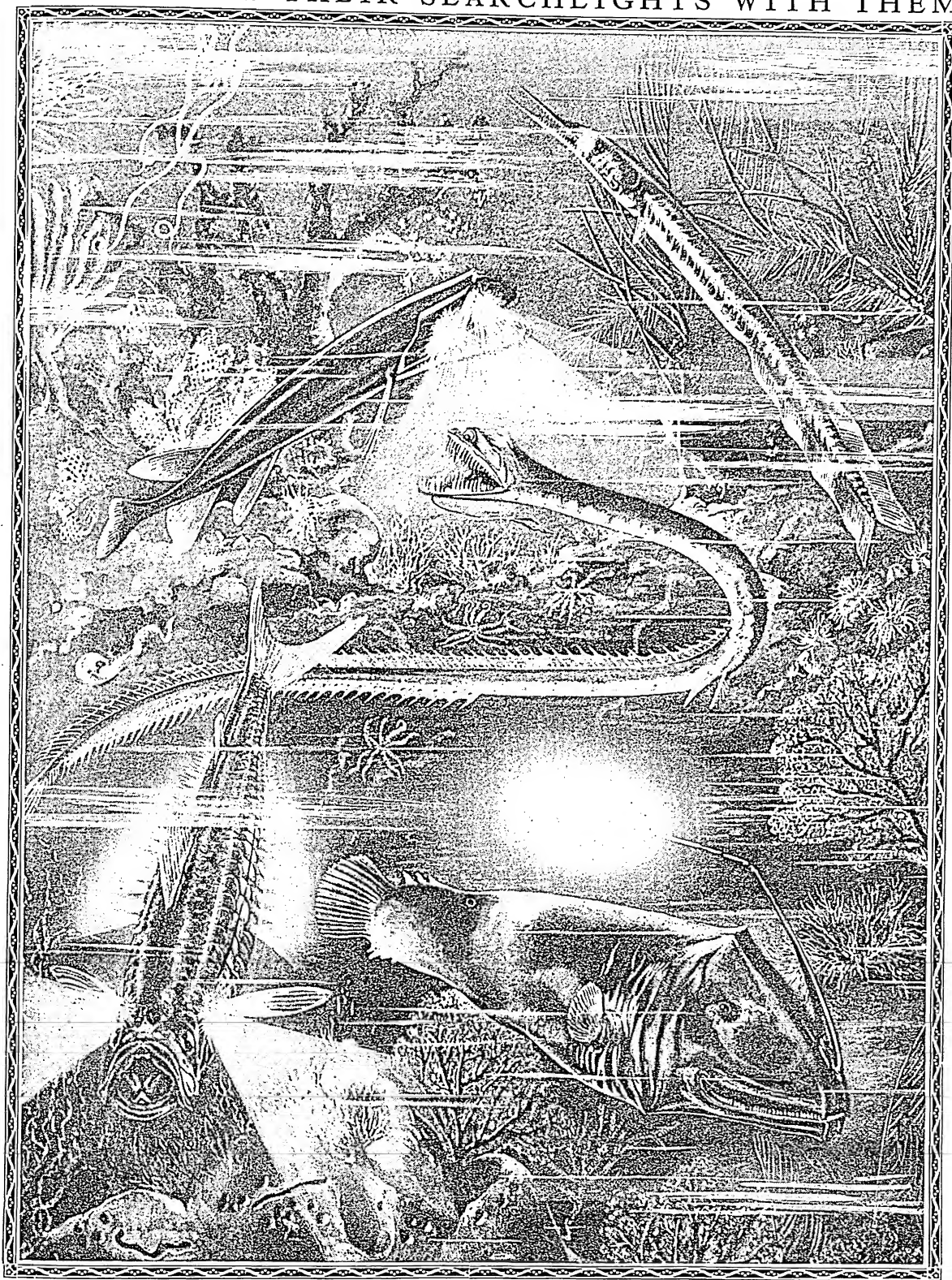
Animals can live under the great pressure of the deep sea because the pressure inside their bodies equals the pressure on the outside. A tin can could never be crushed by pressure from without if the pressure outward on the inside was equal to the pressure in from the outside.

The Curious Danger of Falling Up!

But though the inhabitants of the ocean abysses are able to live under an enormous load of water, they are liable to extraordinary accidents. If, in searching for food, they rise a considerable distance above the floor of the sea, the gases of their swimming bladders expand, and they become lighter. Up to a certain point the muscles of their bodies can resist this strange tendency to go floating upwards; and the deep-sea fish that has not completely lost control of itself can win its way back to its home in the dark cold heavy water. But if it travels too far towards the world of sunlight, its muscles are not strong enough to drive the body down. The fish continues to swell, and is gradually killed in its long and strange voyage to the surface of the sea. Thus the deep-sea fishes are exposed to a danger that comes to no other animal in the world—the danger of tumbling upwards! That such accidents do occasionally occur is shown by the fact that some unknown kinds of fish, now known to be deep-sea forms, were found floating dead on the level of the ocean long before men dreamed that life could exist at such depths. When brought up suddenly from great depths, animals sometimes explode because of the expansion of gases within the body when pressure from the outside is greatly reduced.

The great problem which has perplexed the explorers of the deep sea for many years is the question of how life is maintained so far below the waters. What do the creatures of the abyss feed upon? It is clear that they cannot keep up life merely by eating one another, for this would mean that the biggest would eventually swallow all the rest, and then die of starvation because there was nothing more to eat. All animal life must have plant life to feed on. This is as true of the wild strange animals of the deep as of the cattle of our pastures. But we have seen that no ordinary plants can grow in the sunless underworld of water. How, then, is animal life maintained there?

THEY CARRY THEIR SEARCHLIGHTS WITH THEM



Scientists have thus far, in spite of all their knowledge, been unable to produce light without at the same time wasting much energy in producing heat. The modern fluorescent lamps are the nearest approach to it. But man could save millions more if these fish that dwell in the great ocean depths would teach him the secret of their cold luminescence. It seems strange that many deep-water fish thus always carry a light with them, when many other varieties have not even eyes.

A few years ago no man was able to answer this question properly, and it was not until great progress had been made in the study of those microscopic forms of life that the secret of the ocean abyss was fully revealed.

We now know that in addition to the conspicuous inhabitants of the ocean which can be seen with the naked eye, the waters teem with vast swarms of microscopic life. According to their general habits, all marine organisms can be placed in three groups. The *benthos* are those plants and animals, which live on or are attached to the sea bottom. Such, for instance, are the rockweeds and corals, and many of the worms and mollusks. Organisms which live in the water itself, like the fishes, whales, and seals, and move about actively from place to place are the *nekton*. Still other forms—most of them of microscopic size—which float about passively, drifting here and there at the mercy of the tides and currents, are known as the *plankton*. This last group of plants and animals was practically unknown until the middle of the last century, but we now know that it is the primary and all-important group upon which all other ocean animal life depends.

The Diatoms and the Pastures of the Sea

A traveler over the sea may think he is sailing through an almost barren waste of waters because no life may be visible. But let him draw a fine net of silk through the water and examine the catch of "scum" under a powerful microscope and he will be astonished at the wealth of life which is revealed. He would see *diatoms*, which are single-celled algae encased in a glasslike box, so graceful and varied in shape and so delicately ornamented that no artistic jewelry of the finest manufacture could surpass them in beauty. He would see protozoa, too, with elegant shells of mineral material, strange larvae of all sorts, tiny crustacea, and many other forms of life which only an expert could recognize and name. Minute as are these organisms, many others even smaller he could not see because they escape through the meshes of even the finest net.

Now it is these diatoms and other green plants of the plankton which make the sea a pasture. They are to the fishes and other animals of the ocean what grass is to the cattle in the fields. They live in the surface waters, and especially in the shallow water zone where they can use the sunlight in building up their bodies. They are like little chemical factories, employing the heat and light of the sun in making food from the minerals dissolved in sea water. They multiply at an astonishingly rapid rate and form the basic food for all other ocean animal life. Even when they die their bodies fall into the depths of the ocean and provide food for the animals there.

The value of the diatom does not end with death. Its crystalline case endures for millions of years. Through ages past, diatom shells have accumulated on the ocean floor in immense deposits. Great geological convulsions have frequently raised these ocean

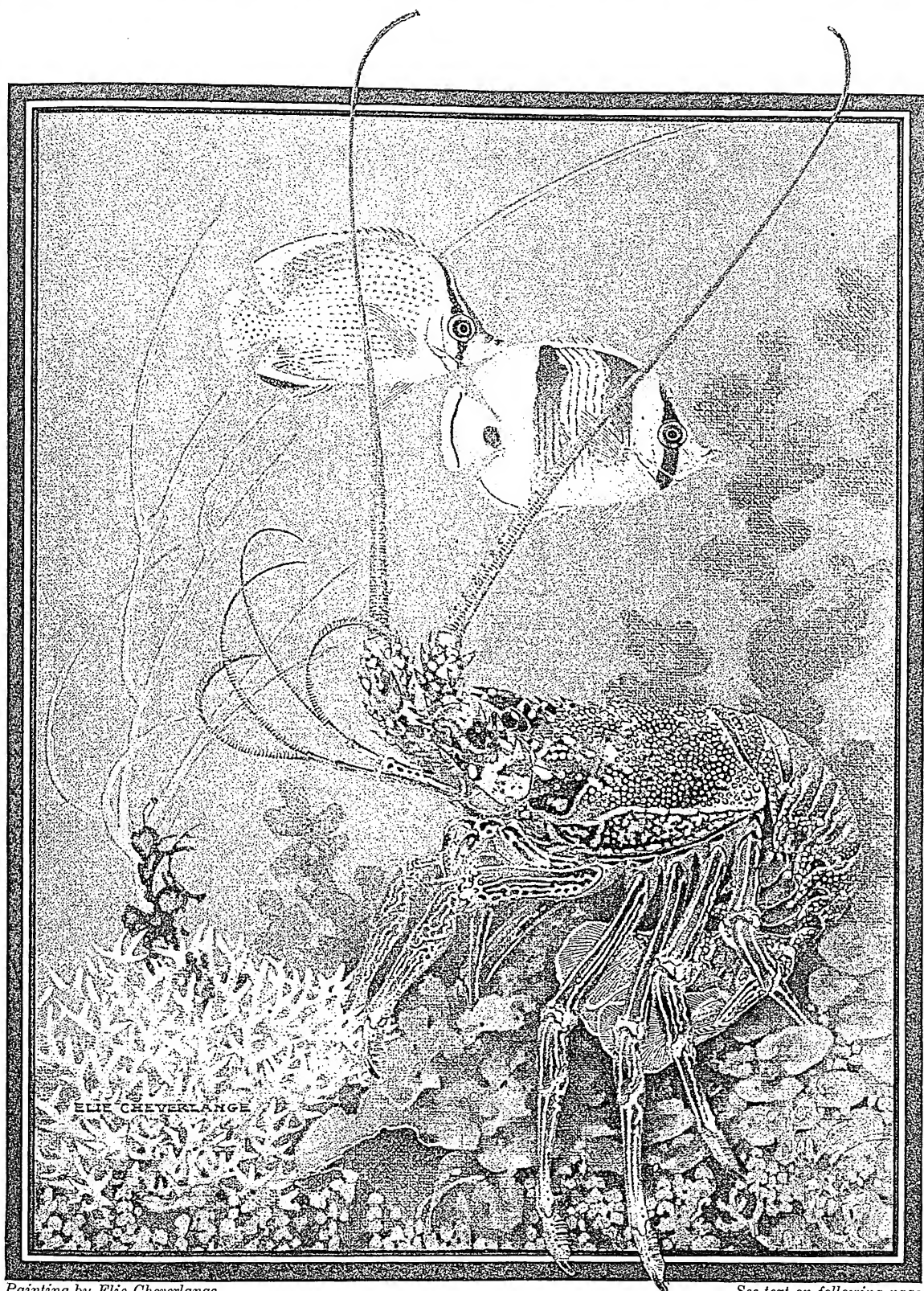
beds and they have become dry land. Thus, the diatomaceous earth, as it is now called, is made available for man's use. It furnishes insulating material against heat and sound, enters into the preparation of dynamite, becomes a filler in making rubber and cement, produces excellent filters, and because of its abrasive properties, it is extensively used in scouring powders and even tooth pastes!

The life of the oceans is most abundant in the surface waters down to about 600 feet, is less abundant in the intermediate depths, and becomes more plentiful at and near the bottom. A whitish or grayish ooze covers about a third of the ocean bottom, and there are vast areas of red clay formed by the decomposition of shells and by pumice and other volcanic materials, and of wind-blown dust. There are extensive "continental shelves," over which the water is shallow, covered with gravel, sand, and silt carried to the sea by the thousands of rivers which ceaselessly pour their floods into the oceans.

Enormous Fish Population of the Sea

If we consider merely the quantity of living matter in the oceans, the mind staggers before it, but a few figures help us to realize it. It was estimated a few years ago that in the small North Sea which sweeps the English coast there were then 10,000 million fishes, and there is a record of a fishing fleet that once ran into a school of mackerel 50 miles in circumference. What helps us most to form some notion of the number of fish in the sea, however, is the number of eggs that fishes lay. Even a sprat deposits about 5,000 eggs, and in the roe of a female cod are found some 8,000,000 eggs. A common herring lays about 25,000 eggs, and a big halibut 3,500,000, while the turbot is authoritatively calculated to lay no fewer than 14,000,000 eggs. Imagine the number of fishes laying eggs at this rate, and one might think that the products of the sea are inexhaustible. But even here, proper methods of conservation are needed.

The principal circulation of the ocean waters is maintained by three factors: (1) winds, (2) unequal temperatures, and (3) variable saltiness of the water. Of these three factors the winds are the most important, and are the chief cause of ocean currents. In equatorial regions the prevailing winds over the ocean are easterly winds, and the equatorial waters are drifted westward under their influence. As this moving surface water strikes the continents—as, for example, South America—it is divided, a part of it being turned northward and a part southward. That turned northward becomes the Gulf Stream of the North Atlantic. The corresponding current in the Pacific Ocean is the Japan Current. These warm currents of ocean water moving northward warm the air over them, and in middle latitudes this warmed air is carried over to the continents on the east sides of these oceans, because in these latitudes the prevailing winds blow from the west. This is one of the reasons why Scandinavia and Alaska are so much warmer than the same latitudes on the east sides of the continents.



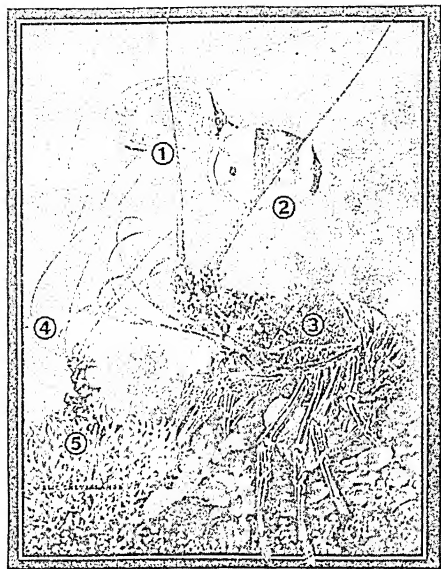
Painting by Elie Cheverlange

See text on following page

SOME UNDER-WATER PORTRAITS

The figures in this plate as well as those in the next plate are portraits in the true sense of the word. They were painted by the artist from actual observations, sketches, and color notes made while walking on the ocean bottom. The detailed story of this remarkable achievement and the identity of his living models will be found in the accompanying text.

SOME UNDER-WATER PORTRAITS



KEY TO PRECEDING COLOR PLATE

THE picture on the preceding page was painted from life by Elie Cheverlange while the artist was studying fishes in the waters surrounding the island of Tahiti, where he then made his home. The creatures portrayed can be identified with the aid of the small key-picture at the left. At the top are two members of the Chaetodon family, small, lively, colorful swimmers of the South Seas, sometimes called "butterfly fish." The two species shown are *Chaetodon citrinellus* (1) and *Chaetodon falcata* (2). Below them with great outspread feelers rests a

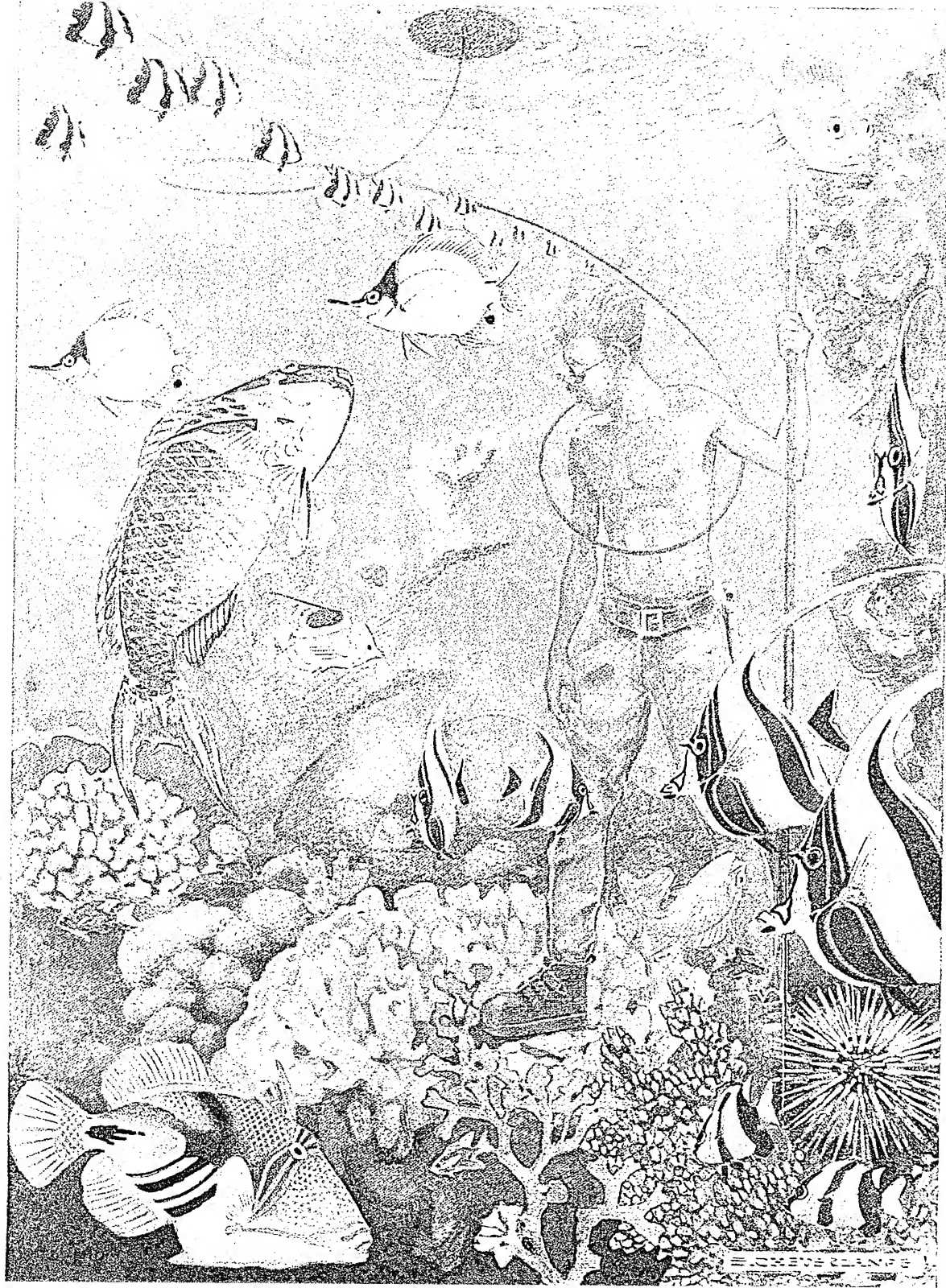
tropical relative of our common lobster, *Palinurus penicillatus* (3). He belongs to the group sometimes called spiny lobsters or sea crawfish, distinguished by the absence of the large pincers carried by his cousins of the Atlantic Ocean. As a table delicacy, however, he is considered more than a match for the latter.

The still life in the painting includes whip coral (4), stony coral (5), and green calcareous alga fringing the bottom of the frame.

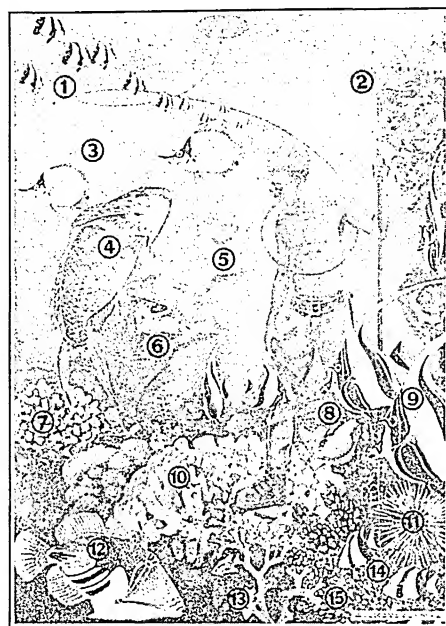
No less interesting than the details of the picture itself is the manner in which the artist gathered his material on the ocean bottom. The color plate opposite shows him on one of his under-water tours of exploration and observation. The painting for that plate was specially made for Compton's Pictured Encyclopedia to illustrate the unique procedure he followed in painting the pictures which have won for him a high place among the relatively few nature painters who combine fine artistic ability with scientific method.

His odd appearance in this self-portrait is due to the faithful representation of two items—the common clothes-pin he is wearing on his nose and the hair of his head which, with its tendency to float, seems to be standing on end.

More information about this artist's method of working under water will be found on the back of the second plate.



THE "PAINTER OF FISHES" AT WORK



KEY TO PRECEDING COLOR PLATE

nose, and in his mouth the end of a long rubber air-tube leading to a float on the surface. Because he breathes in and out through the same tube, which thus accumulates carbon dioxide, he cannot stay down more than 20 or 25 minutes at a time. But this is long enough to make sketches and color notes with a scratching tool on a copper plate coated with dark paint. He carries these implements at his belt. To master difficult details of structure and color he captures specimens and studies them in a small aquarium on shore.

Few of the creatures he encounters in those far-away waters have popular names in English. Those shown here are *Dascyllus aruanus* (1 and 14), *Holocentrus leo* (2 and 8), *Forcipiger longirostris* (3), parrot fish (4), *Acropora prolifera*, a species of coral (5), *Chaetodon ephippium* (6), cup coral (7), sickle fish or Moorish idol (9), millepore coral (10), sea urchin (11), *Balistapus aculeatus*, a species of trigger-fish (12), algae of the *Dyctiota* genus (13), and *Acropora hyacinthus* (15).

Elie Cheverlange is a French war veteran, winner of the Médaille Militaire and the Cross of St. George. He still regards Tahiti as his home, although he is away much of the time illustrating scientific publications in many parts of the world, notably those of the Smithsonian Institution in Washington.

OVER the door of his Tahiti house a bronze plate informed the passerby that Elie Cheverlange was a "Painter of Fishes." In the pursuit of this unusual profession he visited many of the other South Sea islands, among them the Tuamotu or Paumotu Archipelago to the east where the material for the painting on the preceding page was gathered.

The picture shows the artist walking among the coral formations near shore, lead-sole shoes on his feet to keep him on the bottom, a pair of pearl divers' waterproof goggles over his eyes, a clothespin to prevent him from drawing in water through his

From the large bodies of ice in the polar regions, large volumes of ice cold water are poured into the oceans. These cold waters move southward along the east sides of continents, but presently sink beneath the surface. These great supplies of cold water from the polar ice keep the temperature of the ocean low. The temperature of the great body of the ocean is below 40° F., though the surface waters, especially in low latitudes, are much warmer.

The warm currents in the oceans give rise to fogs which are very troublesome to navigation. The warm air over the Gulf Stream, for example, is heavily charged with moisture, and when it is carried by the winds beyond the Gulf Stream over colder waters, the moisture in the air condenses and forms fog.

Pure sea water is a light shade of blue; but it sometimes is a shade of green or brown, owing to foreign matter or plants and animals floating in it.

Why the Ocean is Salty

The water evaporated from the sea is borne to the land, and some of it is condensed and falls as rain or snow. More than 6,500 cubic miles of water falling on the land is yearly sent back to the sea by rivers, carrying with it salts and earthy matters. The saltiest waters are found where evaporation is the greatest, for example, in the Red Sea, and in the trade-wind regions of the ocean basins. Owing to the constant circulation in the ocean, oxygen and other gases of the air are carried down to the greatest depths; thus animals and plants may flourish there.

For sounding the ocean's depths the old-fashioned lead and line is now being discarded for electrical devices such as the sonic depth-finder and the fathometer, by which the depth can be instantly ascertained. These measure the speed of sound waves through sea water, and the depth is estimated by the time that is required for a sound sent from the ship's bottom to echo back from the ocean floor. The supersonic depth-finder is similar except that it uses vibrations that are inaudible to the human ear; automatic electric indicators record the time.

Observations recently taken indicate that along the coasts of the United States the mean surface level of the Pacific Ocean is about two feet higher than that of the Atlantic; furthermore, the levels of both oceans increase in height from south to north.

O'CONNELL, DANIEL (1775-1847). Throughout the 18th century Ireland was badly treated. Roman Catholics were debarred from politics (*see* Ireland). Protestant landlords, most of them in England, lived on a hard-pressed Irish peasantry. Severe statutes prevented Irish manufactures from competing with English. In 1782 the Irish Parliament had been allowed real powers, but after the Irish rebellion of 1798 it was bribed into accepting the Act of Union with Great Britain (1800) by which Ireland was left only with representatives in the British Parliament at Westminster.

Daniel O'Connell was a successful Irish lawyer, himself a Catholic, who undertook to remedy this

condition. He set about uniting the several divisions of the Catholics upon a political program, which included the right of Catholics to sit in the British Parliament, from which they had been excluded since the 17th century. He gained the support of the priests and organized the peasantry in 1823 in the Catholic Association, the dues of which were only a penny a month. The people joined by tens of thousands and the money raised was used to support Irish agitation.

Within a year the association became a powerful political force. It did not matter that the government passed a bill suppressing the association. O'Connell then formed a new society avowedly "for the purposes of public and private charity." Great meetings were held all over the country. O'Connell ventured to run a candidate for Parliament against the powerful Beresford family and beat them. An 11 days' meeting of the peasantry and of Catholics all over the island alarmed the English government, who feared revolution. The Duke of Wellington, who had consistently opposed the Irish claims, now as prime minister agreed with Sir Robert Peel, his chief colleague, that it was better to give the Catholics practically complete rights of voting and holding offices than to risk war. This they did by the Catholic Emancipation Act of 1829, a measure which greatly angered many of their Tory supporters. Similar relief had been extended to Protestant "dissenters" the year before.

But Catholic "emancipation," like so many concessions to Ireland, was 30 years too late. Ireland remained unsatisfied. O'Connell spent the rest of his life in agitation for a repeal of the Act of Union, that is, for the restoration of an Irish Parliament at Dublin, or for what is today called Home Rule. He also sought laws which would insure the rights of the tenants against their landlords, and relieve Catholic peasants of the obligation of paying tithes to the English church. In this last he was successful (1838), but in little else. His great work was done in 1829. He had done much more than emancipate the Catholics. He had roused up a discouraged and cowed people and thus prepared the way for later leaders.

OCTOBER. The name of this month is from the Latin *octo*, meaning eight; it was the eighth month of the year at Rome, but became the tenth when the beginning of the year was changed from March 1 to January 1. At the same time it was increased from 30 to 31 days. Several attempts were made to rename the month in honor of one or another of the emperors, and also in honor of Faustina, wife of Antoninus Pius; but those changes did not last.

OCTOPUS. A sinister sea creature is the octopus, with round soft body, prominent eyes, and eight long muscular arms studded with suckers. Although often called a "devil-fish," it is not a fish, but a mollusk of the class *Cephalopoda*. Lurking along rocky coasts, it preys mainly on crabs and lobsters. Most species are small, but in tropical waters some grow big enough to be formidable to man (*see* Cuttlefish, Squid, and Octopus; Mollusks).

ODESSA, RUSSIA. The train rolls through mile after mile of oats and barley and waving fields of golden corn or wheat until it comes abruptly to the end of the steppe, between the two great rivers, the Dniester and the Dnieper. There on the brink, looking out over the Black Sea, stands Odessa, an important port of the Ukrainian Soviet Socialist Republic.

Along its tree-arched avenues and broad boulevards are magnificent houses which were once the homes of the rich and noble, but are converted now into workmen's tenements, communist clubs, or government offices. Mineral waters and mud baths near the city attract health seekers.

Odessa's recent history has been marked by disaster and tragedy. Before the first World War it had been the commercial capital of South Russia and one of the world's busiest seaports, handling Russia's vast grain exports. The revolutionary fighting of 1917-20 laid large parts of the city and its suburbs in ruins, and later famine years brought terrible suffering. With the collapse of Soviet Russia's foreign trade, it has never regained its former prosperity. In the Russo-German war which began in 1941 as part of the second World War, fresh disaster came when it was captured by the Germans after heavy fighting.

Besides its activities as a port, Odessa has shipbuilding, metal, glass, oil, agricultural machinery, and cork industries. The exports are chiefly grain, linseed, timber, wool, and cattle. Machinery, iron, steel, and cotton are the principal imports.

Catherine the Great founded the city on the site of an old Turco-Tatar village in 1794, as a steppingstone toward Constantinople. Population, about 605,000.

ODIN. When the long dark winter evening settles down on the Northland, the children gather around a great pine-log fire and listen to grandmother's wonder tales of Odin, father of the gods of Scandinavian mythology.

Many, many years ago, the story runs, there arose from the center of the earth a lofty mountain, so high that it reached to the clouds. On the top of this mountain was a beautiful green plain, in the midst of which stood the shining city of Asgard, home of the gods. Chief among these gods was Odin (sometimes called Woden), who sat on a golden throne in the center of the plain, and directed the wind, the rains, and the seasons. On Odin's head was a shining helmet, and in his hand he carried a spear made from a bough of the great ash, Ygdrasil, the tree of life. Over his shoulders was thrown a beautiful mantle, the color of the summer sky, and this was trimmed with twinkling stars, for Odin was the god of the heavens. At his feet lay two wolves which he fed from his hand, and on his shoulders perched two ravens who each morning flew over the earth and brought back news of what was going on in the world.

Though Odin ruled over the heavens, the earth, and the underworld, there was one place that he could not control. This was Jotunheim, the home of the frost

giants, a dreary frozen country that lay to the north beyond the seas. These giants waged unceasing warfare against the gods and men, and Odin longed for the wisdom that would make him greater than any of the giants and enable the gods to triumph over them.

The only way in which this wisdom could be acquired was by drinking from the fountain of knowledge. This Odin decided to do, and mounting his eight-legged steed he crossed the rainbow bridge that connects the heavens with the earth. At the end of the bridge stood Ygdrasil, whose roots and branches bound together underworld, earth, and heaven. This tree was always green and its leaves never withered, for its roots were watered by a stream from the fountain of knowledge which gushed forth at its foot.

He Gives an Eye for Wisdom

Mimir, an old, old giant with snowy beard, guarded the sacred fountain, and none without his consent could drink of its waters. When he saw Odin approaching he said.

"What does the father of the gods seek so far from sunny Asgard?"

"I have come to beg a draught from your well, O Mimir," answered Odin.

"Whosoever drinks from this fountain," said Mimir, "must be willing to give much in return."

"I will give whatever you ask," replied Odin. So Mimir handed him a drinking horn, saying:

"Drink, then, and the wisdom of the ages shall be yours; but you must leave me one of your eyes."

Odin thereupon drank, and forfeited his eye; and ever after there was no one in all the worlds who could compare with him in wisdom.

Though Odin was really the god of the heavens, he was ruler of the earth as well, and it was he who created men and put them on the earth, teaching them to fish, hunt, and till the soil. Being a warlike god he also taught them to fight gloriously in battle, and he sent his messengers, the Valkyries, to lead the souls of the hero dead to Valhalla, the hall in heaven of the gloriously slain. Here the departed warriors lived, reveling in those joys which had been dearest to them on earth, fighting bloody battles by day and feasting by night, their wounds healing at once.

How Wednesday Got Its Name

When the ravens would return from their flight over the earth, they would tell Odin of hard-fought battles and of brave deeds of heroes. Sometimes they brought news of the swarthy elves who lived under the earth, making wonderful things from gold; silver, and brass; and sometimes they told him that Midgard, the great serpent who encircled the earth, was lashing the waters with his tail, turning the seas into foam and rolling up great waves that threatened to cover the land. So Odin lived, ruling the world wisely and kindly. In his honor the fourth day of the week is still named Wednesday, or "Woden's day." Odin is sometimes identified with the Roman Mercury, which explains why the French call the fourth day of the week "Mercury's day" (*mercredi*).

ODIN BEGS A DRINK FROM THE SACRED FOUNTAIN



Odin, already the ruler of the heavens, the earth, and the underworld, seeks the wisdom which will also make him more powerful than any of the giants of Jotunheim. With him are the black ravens, Huginn (Thought) and Muninn (Memory), who kept him informed about happenings on the earth.

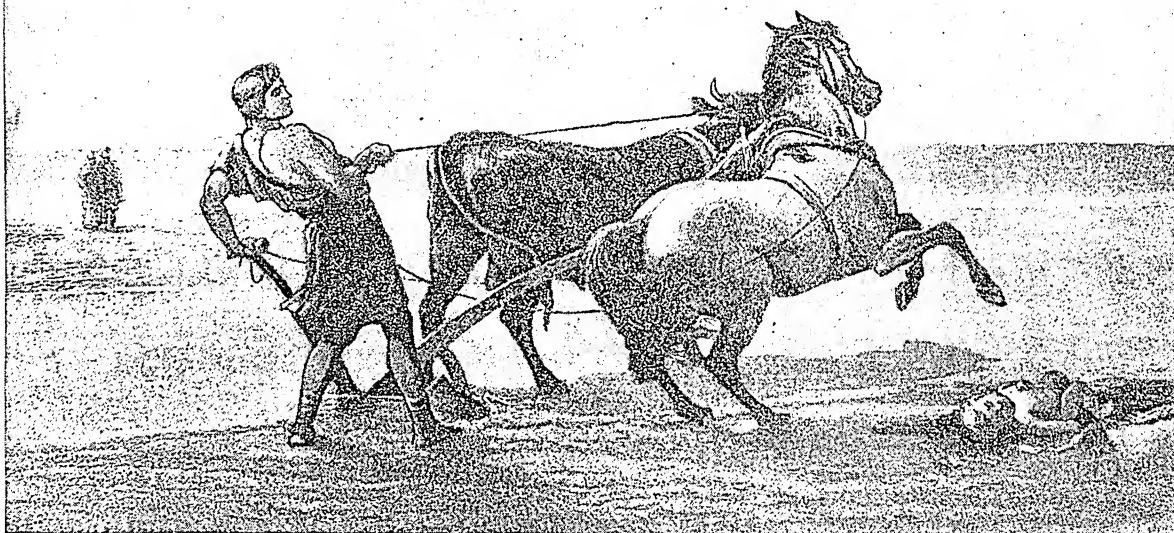
ODYSSEUS (*ō-dis'ūs*). One of the greatest of the Greeks who warred against the Trojans was the hero Odysseus (later called Ulysses by the Romans). He was king of the rugged little island of Ithaca, off the west coast of Greece, and when summoned to join his brother chieftains was unwilling to leave his fair young wife Penelope and his little son Telemachus while he went to battle in a foreign land. In order to escape he feigned insanity. When the prince Palamedes came for him, he found Odysseus, pretending to be a farmer in his field, plowing the sand on the seashore, which he had sown with salt. But Palamedes took the baby Telemachus and laid him in the line of the furrow, where the plowshare would strike him. Odysseus quickly turned the plow aside, thus showing that his insanity was make-believe.

When Odysseus saw that he could no longer refuse to go to the war he lent his aid to bring in other reluctant chiefs, among them the great Achilles (see

Achilles). He fitted out 12 ships for the expedition, and during the war distinguished himself as the wisest advisor of the Greeks, as well as one of their bravest fighters. Well did he deserve the title of "the crafty Odysseus." It was he who devised the stratagem of the wooden horse, and he was one of the men who hid within it and thus captured the city of Troy (see Trojan War).

When the war was over, Odysseus with his 12 ships laden with treasures from the conquered city set sail with a glad heart. It was ten years since he had left home and he hoped now for a speedy return. But the gods willed otherwise. Little did he dream that ten years more should pass before he saw his dear wife and child again. The story of the return journey of Odysseus, of the adventures of this "much-enduring man" and his infinite resources and stratagems, is told in the great epic poem called the 'Odyssey' (see Homer).

SOME ADVENTURES of the GREAT-HEARTED ODYSSEUS



The Land of the Lotus Eaters

HOSTILE winds had sent Odysseus' ships wandering over the deep, and driven them to the south, far out of their course. After many days land was sighted and the waves rolled them shoreward.

The men that Odysseus sent ashore for water found an enchanting land, and friendly people who gave them the fruit of the lotus to eat. This fruit had such magical sweetness that it made the eaters forget their commander and the waiting galleys. Forgetting, too, their wives and children and native land, they wanted only to stay, eat that delightful food, and live in a blissful dream forever.

When Odysseus learned how his men had been put under that spell of forgetfulness, he went ashore with the rest of his crew. Binding the dreamers hand and

foot, he carried them back to the ships. Then he spread the sails, the rowers plied the oars, and he fled so fast from the enchantment of Lotus Land that all the quiet seas were beaten into foam.

Elsewhere in this work is told the story of Odysseus' narrow escape on the island of the Cyclops; of the bag of winds given him by Aeolus; and of how he overcame the enchantment of the sorceress Circe (see Aeolus; Circe; Cyclops).

How Odysseus Escaped the Sirens

AFTER these strange adventures Odysseus and his men neared the island of the Sirens. These were the treacherous sea nymphs whose sweet singing lured mariners to destruction on the cruel rocks of the island. Odysseus well knew his peril, for he had been forewarned by Circe.

The winds ceased; the sea fell quiet; the very air was so still that it seemed as though the gods in heaven listened for that celestial harmony. Melting wax, Odysseus stuffed the ears of his men; but wishing to hear the singing of the Sirens himself, and yet to escape with his life, he had himself bound to the mast. Then he ordered his men to row with great speed past the island where the fair wicked sisters twain sat on the green mead and sang. He knew that if he was lured to their land, his bones would whiten in the grass at their feet. Yet such was the charm of their voices that when their clear-toned song reached his ears he begged and commanded his men to loose him. But they, obeying his first orders, bound him yet more securely. And they never stopped rowing until that fatal shore was left behind.

Between Scylla and Charybdis

ODYSSEUS had not gone another hundred leagues before he faced another peril against which Circe had warned him. When he saw smoke above a mountain peak, heard a yelping as of dogs, and the rushing of waters in a whirlpool, he knew that his galleys were nearing the Straits of Messina, between Sicily and Italy. There the sea boiled and roared between rocky walls. On one side the sea monster Scylla dwelt in a cliff whose top was shrouded in storm clouds. When a vessel passed she stretched out six hideous heads from her cave and snatched six sailors from the deck. On the other side, across a welter of foam, rose the dread cliff of Charybdis. Here under a fig tree dwelt a still more fearful monster with one huge mouth. Thrice every day she sucked in the sea, and then belched it forth seething like a huge caldron on a fire. Any hapless passing ship with its men was hurled to ruin; there was no escape.

Choosing the lesser peril, Odysseus steered closer to Scylla. With her terrible long-necked heads, she seized six of the rowers, bore them writhing to the cliff, and devoured them while they shrieked in the death struggle. "And this was the most pitiful thing that mine eyes have seen of all my travail in searching out the paths of the sea," said Odysseus when he recounted his adventures.

The Island of Calypso

BUT still further woe awaited them, for Odysseus' men devoured the sacred cattle of Helios, the sun god, on the Isle of Thrinacia, and for this offense Zeus (Jupiter) destroyed their ship by a thunderbolt. All were lost save Odysseus himself, who floated for nine days on a raft, and on the tenth day was cast ashore on the beautiful Isle of Ogygia, far off in the western sea.

Here in this land so fair that even the gods wondered at the sight, dwelt the sea-nymph Calypso in a lovely grotto-palace. Round the cave blossomed a wood of alder and poplar and sweet-smelling cypress, and clusters of purple grapes hung over the entrance. Sparkling fountains mingled their gentle plashing with the songs of birds, and violets and mosses carpeted the ground.

But Odysseus had no mind to these pleasant sights nor yet to the sweet singing of the goddess. Eight years he dwelt here with her, sorely against his will, for she loved him and would not let him depart. She would have made him immortal if he would have remained with her forever. But he refused the boon and ever besought the gods to relent and let him return home to his beloved island of Ithaca, where dwelt the wife and child he had not seen for so many weary years.

At last Athena (Minerva) interceded with her father Zeus in behalf of the hero, and the father of gods heard her request and sent a messenger to Calypso bidding her send him thence. The nymph dared not disobey. She gave Odysseus a great ax and augers to build a raft and with her own hands wove him sails and showed him the star by which he should steer. So the great-hearted Odysseus embarked once more on his voyage.

The Lovely Princess Nausicaä

BUT Poseidon, ruler of the deep, was not yet minded to give Odysseus rest from his troubles. Seeing him near the end of his journey, he roused all the winds of heaven against him, so that he was buffeted about for many weary days. At length when his raft had been dashed to pieces, he stripped off his clothing, and swam for two days and two nights, Athena helping him, until a great wave bore him to shore on the island of Scheria, the country of the Phaeacians, a people like to the gods. Overcome with weariness and faintness, Odysseus crept into a thicket of olive trees, and lying down on a pile of leaves, fell asleep.

It happened that same night that Nausicaä, the fair daughter of Alcinöus, king of this land, had a dream in which Athena appeared to her, telling the maiden that her wedding day was near, and bidding her arise at daybreak to wash the garments of the family that all might have seemly raiment.

Early the next morning, the clothes were heaped in a high wagon, and Nausicaä with her attendants drove out of the city to the bank of a clear-flowing stream to do their work.

When all the linen had been carefully washed and spread in the sun to dry, Nausicaä and her maidens bathed and dressed their hair. Then they ate and played games. So tall and fair and graceful was Nausicaä that when she played ball with her maidens she looked like the goddess Artemis among her nymphs.

In a mischievous mood she threw a ball so that it bounded from the rocks and splashed into the river. The girls screamed so loud that Odysseus awoke. They fled in terror as he stalked forth like a lion. He was covered with salt and matted seaweeds, and for clothing had only a leafy bough which he held before him. But Nausicaä stood firm, for she was the daughter of a king.

"Oh, maiden," the stranger said, "I know not if thou art a princess or a goddess, for never did I see so fair a flower as thou. Have pity on me and give me an old garment to cast about me."



"The stranger glowed with such beauty and grace that all marvelled at him."

When he had bathed himself, and donned one of her brother's tunics that she had fetched to the washing, the stranger glowed with such beauty and grace that all marvelled at him. After the maidens had given him food and drink Nausicaä mounted her car and bade him follow to her father's palace.

A feast was spread for him in the great hall, where there was an open fire, sweet music, soft cushions, and a glitter of gold and silver. When a blind bard began to sing of the Greek heroes of the Trojan war, the illustrious stranger was overcome with emotion. At last he announced himself as Odysseus, King of Ithaca, and companion in arms of Achilles, Agamemnon, Menelaus, and other heroes of that war. There was great excitement, for everyone had heard of the brave, wise, and clever Odysseus who, by the artful trick of the wooden horse, had opened the city of Troy.

While a ship was being made ready to carry the hero-king home, Odysseus told of the dangers he had come through. Here was the hero of Nausicaä's dreams, but he was not for her! With her heart swelling in her breast she stood, tall and pale and lovely, by a silver pillar, and listened to his wild tales.

"Farewell, stranger," she said, with a touch of sadness at the thought that she would never see him again. "Remember me for a time, because thou owest thy life to me."

"All my days forevermore shall I do thee worship as a god," Odysseus warmly returned; "for thou, lady, hast given me my life."

The next evening the great-hearted king Alcinoüs put the hero on board a ship and gave him many gifts. And as the vessel went flying like a seabird over the

waters toward Ithaca, Nausicaä said to herself with a sigh: "Would that such an one as Odysseus might be called my husband and abide here with me!"

Penelope and the Suitors

TWENTY years had now passed since Odysseus had set out for Troy. His son Telemachus had grown to manhood. His faithful wife Penelope still awaited him, never ceasing to pray the gods for his return. No wandering beggar came to Ithaca but she questioned him for tidings of her husband.

When Odysseus had been gone 17 years, suitors for Penelope's hand appeared. Five score and more of the nobles of Ithaca and of the neighboring islands came with their minstrels and servants, and took up their abode in the palace of Odysseus. Each one hoped to wed Penelope, so that he might rule over Ithaca and possess the flocks and herds, fields and vineyards of Odysseus. Telemachus was his father's heir, but he was but a youth, without powerful kindred to defend him. So these insolent intruders wasted the wealth of the absent king, plotted against his son, and persecuted his unhappy queen.

The wise Penelope devised a plan to delude her suitors. She must weave a winding sheet for Odysseus' age-stricken father Laertes before she could wed again, she said, and so she retired to her chamber and sat at her loom. But the web of her cloth grew not in length, for what she wove by day she raveled by night. For three years this stratagem stood her in good stead, until her wooers discovered it. More insolent than ever when they learned the trick that had been put upon them, they pressed Penelope with increased persistence to make her choice.

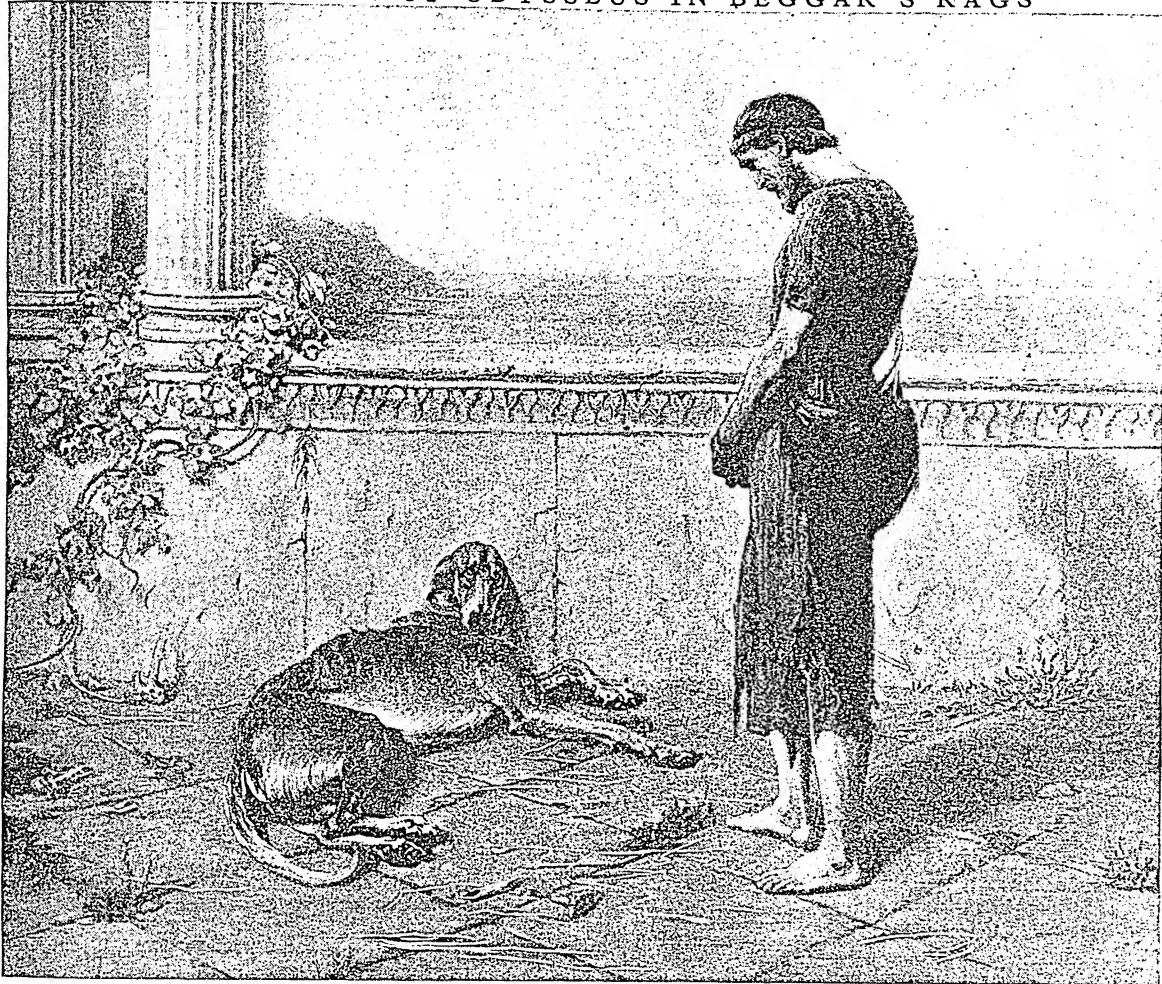
The Return of Odysseus

BUT the day of reckoning was at hand, for at last the gods had brought Odysseus safely to his homeland. That he might not be known the goddess Athena changed him into the form of an old beggar in filthy rags, and in this guise he was received in the hut of Eumaeus, a swineherd, who had been his faithful servant. Thither came Telemachus, who

all the weapons out of the great hall, that the suitors might have no means of defense when the hour of vengeance came.

Then Telemachus departed to his chamber, leaving his father alone in the hall, devising plans for the morrow. Presently the wise Penelope came down to sit by the fire. Her beauty, long marred by tears and grief, was as radiant as in the days of her youth, for

THE RETURN OF ODYSSEUS IN BEGGAR'S RAGS



"In his beggar's disguise, Odysseus went boldly to the palace. No man knew him. But his faithful dog Argus, worn out by age and neglect, recognized his master and wagged his tail in joyful greeting, just as he was breathing his last."

had just returned from a fruitless quest for news of his father. Revealing himself, Odysseus embraced his son with rapture, and then the two took counsel together how they might kill the hated suitors.

In his beggar's disguise, Odysseus went boldly to the palace. No man knew him. But his faithful dog Argus, worn out by age and neglect, recognized his master and wagged his tail in joyful greeting, just as he was breathing his last.

The unsuspecting revelers received the returned king with insults, ridicule, and violence. When they had departed for the night Odysseus and Telemachus took

the goddess Athena had restored it while she slept. Long she questioned the beggar, hoping for news of her absent lord. He told her that he had recently seen Odysseus, who was now at last on the point of returning to Ithaca.

Overjoyed, Penelope returned to her chamber. She called the old servant who had nursed the hero in his infancy and bade her attend to the wants of the beggar. As the aged nurse was washing his feet she recognized a scar on his instep and cried out with joy. But the king put his hand over her mouth and bade her keep his secret.

The next day the wooers returned to their revelry. After the banquet Penelope took down the great bow of Odysseus from its place on the wall and declared she would wed the man who could bend the bow and send an arrow through 12 rings suspended in a row.

One after another the suitors essayed the feat and failed. Only the despised beggar was able to bend the bow and send the arrow to its mark. Then suddenly stripping off his rags, Odysseus leaped to the threshold and sent arrow after arrow whizzing among the panic-stricken suitors. The doomed fell thick, one upon another, and when his arrows were spent Telemachus brought him shield and spear. With fresh fury the king and his son renewed the slaughter, and ceased not until the last man of the suitors and their retainers was dead.

The bodies of the slain were carried out, the air was made sweet with incense, and Odysseus was clad in his royal robes. Then the old nurse was sent to Penelope with the joyful news of her husband's return after 20 long years of absence.

OEDIPUS (*ed'-ip-s*). Perhaps the most tragic hero in Greek legend is Oedipus, king of Thebes. His father Laius, king of Thebes, learned from an oracle that his own son should kill him; and he therefore pierced and bound the feet of the new-born babe and caused him to be exposed on Mount Cithaeron, in order that he might perish. But a kind-hearted shepherd found the child and named him "Oedipus," meaning "swollen foot." The child was brought to the king of Corinth, who, having no heir, reared him as his own son. When Oedipus was grown to manhood he learned from an oracle that he was to kill his father and marry his own mother. To escape so dire a fate he decided to leave home, for he believed that the king of Corinth was his father.

On his way to Thebes, he met a chariot in which sat an aged man. An attendant who preceded it rudely ordered Oedipus out of the way and a combat followed, in which Oedipus slew both master and servant. So the first part of the oracle was fulfilled, for the aged man was Oedipus' real father, King Laius.

About this time a terrible Sphinx appeared in the neighborhood of Thebes (*see* Sphinx). This monster put to all who passed her a riddle, and forced them to guess it or suffer death. Many were devoured, for no one was able to give the correct answer. To rid themselves of this terrible scourge, the Thebans offered the vacant throne and the hand of Queen Jocasta to whoever should overcome the monster.

"What animal," asked the Sphinx when Oedipus confronted it, "walks on four legs in the morning, on two at noon, and on three at night?"

Oedipus quickly replied: "Man, for in the morning, the infancy of his life, he creeps on all fours; at noon, in his prime, he walks on two feet; and when the darkness of old age comes over him he uses a stick for better support as a third foot."

Thereupon the Sphinx dashed herself over the rocky precipice and perished.

Oedipus then became king and was married to his mother Jocasta, thus fulfilling the second part of the oracle. Soon the country was devastated by a terrible plague. The oracle, when consulted, promised relief when the murderer of Laius should be banished. Oedipus then learned from a seer that he had fulfilled the prediction of the oracle and killed his father, and married his mother. In horror he put out his eyes, while his mother hanged herself. A blind and helpless outcast, Oedipus wandered away with his daughter Antigone, who remained faithful to him. She alone followed her blind father into exile, and cared for him until his death.

The Tragedy Continues

The tragic fate of Oedipus descended to his children. After his abdication, his two sons, Eteocles and Polynices, became joint rulers of Thebes. Eteocles, however, desiring to rule alone, seized the reins of government and expelled Polynices from Thebes. Thereupon Polynices repaired to Argos, where he married the daughter of Adrastus the king, and enlisted the latter's help against Eteocles.

Adrastus and the Argive army attacked Thebes with great valor. The loss of life was terrible. Finally Eteocles, grieved to think that all this bloodshed was on his account, offered to decide the issue by single combat with his brother. The duel took place just outside the city walls. Both Eteocles and Polynices were mortally wounded and died on the field.

Creon, brother of Queen Jocasta, now became king of Thebes. He gave Eteocles burial with royal honors, but decreed that the body of the younger brother should lie unburied. Antigone dared to defy the royal edict, and performed the funeral rites necessary to give his soul rest in Hades.

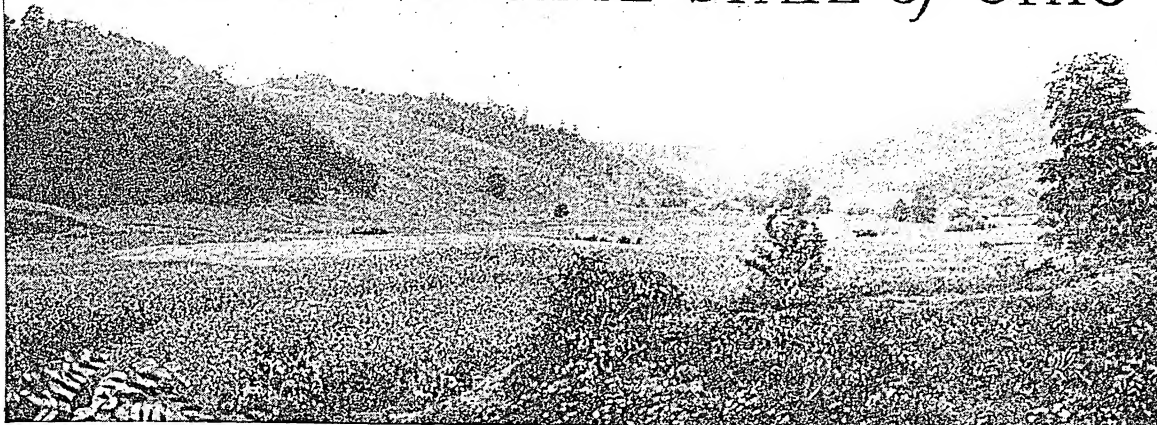
Sophocles Tells the Story

The Greek dramatist Sophocles tells the story of Oedipus and his children in the great trilogy of 'Oedipus the King', 'Oedipus at Colonus', and 'Antigone'. In this last play he gives a beautiful picture of the noble character of the heroic maiden. When Creon asks: "And thou did'st dare to disobey these laws?" Antigone replies:

Yes, for it was not Zeus who gave them forth,
Nor Justice dwelling with the Gods below,
Who traced these laws for all the sons of men:
Nor did I deem thy edicts strong enough,
That thou, a mortal man, should'st over-pass
The unwritten laws of God that know not change.
They are not of today nor yesterday,
But live forever, nor can man assign
When first they sprang to being.

But Creon was unmoved. Even the pleas of his son, Haemon, who loved Antigone, were of no avail, and she was condemned to die by being buried alive in a cave. Haemon succeeded in entering the vault, but too late, for Antigone was already dead; whereupon he threw himself on his own sword and expired beside the body of his beloved Antigone. His mother, Eurydice, in her grief, killed herself. Thus Creon was doomed to a widowed and childless old age.

The BONNIE BUCKEYE STATE of OHIO



OHIO. Ages ago the region that is now Ohio had been marked out by nature to become a rich and populous state. Seams of coal, beds of clay, and pockets of natural gas and petroleum were stored up beneath the surface to

afford materials for great industries. The ice sheet that once covered all but the southeastern part of the state left behind the deep fertile soil that makes Ohio one of the leading half-dozen agricultural states. To the north was Lake Erie, a gateway to the Atlantic seaboard on the one hand and on the other to the iron ores of the great Lake Superior ranges; to the south was the broad Ohio River, destined to become a highway of travel and commerce leading to the Mississippi and the Gulf of Mexico.

By virtue of these and other natural endowments Ohio is today the fourth state in population, though only 34th in size. It is one of the leaders in iron and steel, rubber tires, coal, motor cars, and clay products. In total manufactures, mineral production, and agriculture, it also ranks high. The first state to be carved out of the old Northwest Territory, settled by a sturdy pioneer people from the older states, and receiving the cream of European immigration, Ohio has also had an enviable record of citizenship. Seven of its sons have been presidents of the Union—Ulysses S. Grant,

Extent.—East to west, 215 miles; north to south, 210 miles. Area, 41,222 square miles. Population (1940 census), 6,907,612.

Natural Features.—Surface in southeast, hilly (part of Appalachian Plateau); western half, rolling plain (part of Central Plains); much of northwest perfectly level. Northern boundary formed in part by Lake Erie, southern by Ohio River. Chief rivers: Ohio, Muskingum, Maumee, Scioto, Little Miami, Miami. Mean annual temperature, 51°; mean annual precipitation, 38".

Products.—Corn, wheat, hay, oats, tobacco, fruits, vegetables; live stock, dairy products; steel, pig iron, rubber tires, electrical machinery and supplies, automobiles, automobile bodies and parts, clothing, pottery, glass; clay, petroleum, coal, gas, stone.

Cities.—Cleveland (878,336), Cincinnati (455,610), Columbus (capital, 306,087), Toledo (282,349), Akron (244,791), Dayton (210,718), Youngstown (167,720), Canton (108,401).

Rutherford B. Hayes, James A. Garfield, Benjamin Harrison, William McKinley, William Howard Taft, and Warren G. Harding. An earlier chief executive, William Henry Harrison, was a citizen of Ohio, though born in Virginia. Many other

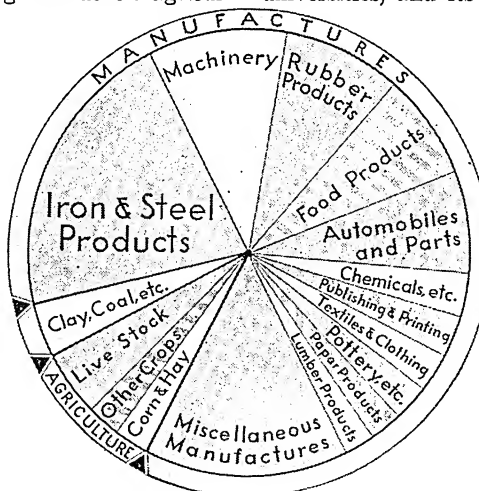
Ohioans have held high places in national life.

The public spirit of Ohio's people is reflected in its educational system, topped by some 40 colleges and universities, and its advanced political institutions.

Its cities have "home rule," allowing them to frame their own charters, choosing between mayor-council, commission, and city manager government.

Geographical position and convenience of transportation are chief among the causes that have made Ohio great. From the days of the aboriginal peoples of America, Ohio has been the avenue of travel for all who crossed the Appalachian barrier north of the Cumberland Gap. The natural northern land routes across the eastern mountains are largely determined by the valleys of the Ohio's source streams and eastern and southern tributaries. These

land and water routes, all converging toward the Lake Erie and Ohio River region, were followed by the first white settlers to the Old Northwest. Through New York State to Lake Erie, then westwardly along its shore, came New Englanders. Pennsylvanians, setting out from the headwaters of the Ohio in their



In comparison with the output of its manufacturing establishments, the value of Ohio's farm and mine production is small, as this chart plainly shows.

own state, followed its course into the lower Ohio basin. Virginians and Carolinians passed from the valley of the Shenandoah through the mountain gaps into Kentucky, whence they and the Kentuckians reached southwestern Ohio.

A forest region, such as early Ohio was, is not so easy to subdue as prairie land. Yet so irresistibly did

by neglect and the competition of the railroads. Lately, however, it has been proposed to deepen the Ohio and Erie Canal.

The first state to follow New York's example in canal-building, Ohio was likewise a pioneer in railroad construction. The same natural trend of the land that guided Indian and pioneer travel makes Ohio a

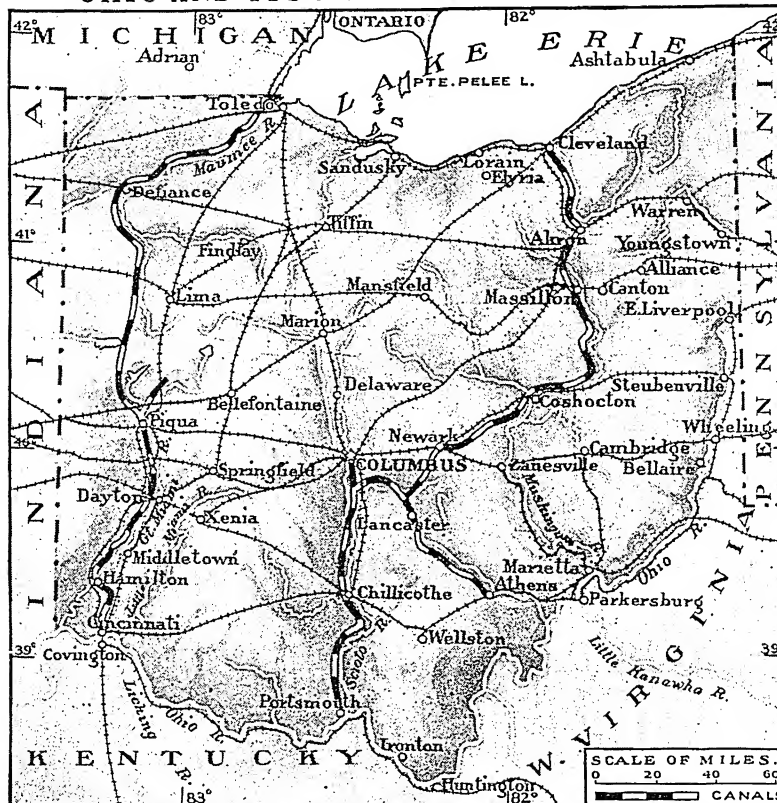
great railway state today. Following the river valleys, the important northern trunk lines crossing the Appalachians converge on either the Ohio Valley or the Lake Erie basin, making Cleveland, Cincinnati, Columbus, and Toledo leading railway centers. Ohio has over 8,000 miles of steam railways and over 3,000 miles of electric railways. There are over 10,000 miles of surfaced roads in the state highway system.

Though the railroads have killed the canals, water transportation remains an important element in Ohio's commercial prosperity. This state in the heart of the continent has 15 important ports on Lake Erie, chief among them being Cleveland, Toledo, Sandusky, Ashtabula, Conneaut, Fairport Harbor, and Lorain; while Cincinnati, on the Ohio River, commands the large and growing commerce of that stream, on which \$100,000,000 has recently been spent. (See Ohio River.) Lake Erie is of the utmost importance in moving such bulky commodities as coal, iron ore, and the limestone used as a flux in iron furnaces. Ohio with her five-billion-dollar annual manufacturing output must have cheap and easy access to these essentials of industry.

A state or a country which commands coal and iron in addition to

the main thoroughfares of transportation has all the material elements of greatness. Ohio, commanding all three, can truthfully claim to be, as the state motto declares, an *imperium in imperio*. The state has a wealth of minerals, including coal, iron, glass sand, clays, salt, petroleum, natural gas, limestone, sandstone, gypsum, mineral waters, some potash, and pyrites. Clay products, such as pottery, brick, and tile, amount to something like a hundred-million-dollar industry, and a large proportion of the nation's grindstones is cut from the variety of Ohio sandstone called Berea grit. The manufacture of cement has grown steadily. The lean native iron ores of the state have not been worked since modern transportation has

OHIO AND ITS MANY THRIVING CITIES

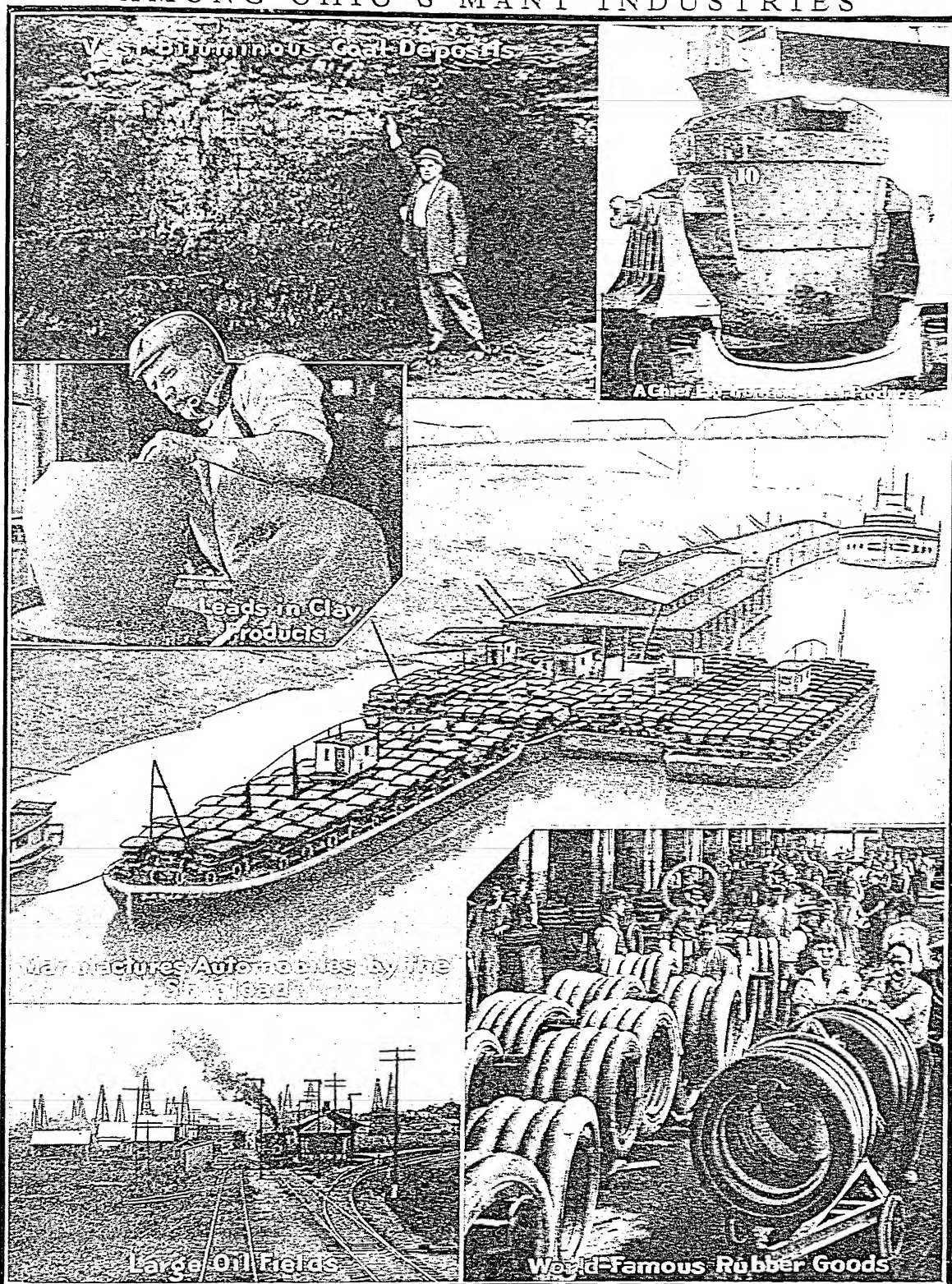


AGRICULTURE	MANUFACTURING	TRADE AND TRANSPORTATION	OTHER OCCUPATIONS
-------------	---------------	--------------------------	-------------------

Ohio might well be likened to an immense factory, with just the right amount of countryside between its many manufacturing centers to give breathing space and raise food. Located astride of the great routes of travel from the east to the central and western states, it enjoys unusual industrial and commercial advantages. The canal systems shown by the map once played an important part in Ohio's transportation, but now have fallen into decay and lost most of their importance.

the converging thoroughfares direct the stream of immigration into the Ohio region that by 1830 it had reached its present rank of fourth in population, and had the resources within itself to make the first improvements in transportation facilities. When New York State finished the Erie Canal in 1825, Ohio was enthusiastically eager—and able—to follow its example. The importance of Cleveland began with the completion of the Ohio and Erie Canal in 1835. Toledo's growth similarly dates from the completion of the Wabash and Erie canal in 1843 and the Miami and Erie in 1845. Too shallow to carry modern freight cargoes, the Ohio canals, like most canals in the United States, are today abandoned and decayed—destroyed

AMONG OHIO'S MANY INDUSTRIES



Here are a few of the many industries which make Ohio's name known the world over. Her coal deposits furnish fuel, and the state is a famous producer of iron, steel, and machinery. It also makes some of the finest pottery in the United States. Down the Ohio River passes a vast stream of industry, including such shipments as the bargeloads of Ohio-made automobiles in the picture. Oil wells and natural gas add to the state's wealth, and the tire and rubber-goods industry, centering in Akron, markets its wares in every land on the globe.

brought the high-grade ores of the Lake Superior district to the Lake Erie ports, there to be manufactured into pig iron or to be transhipped for that purpose to Pittsburgh, Youngstown, Steubenville, Columbus, or Ironton. Cleveland was for years the chief transshipping port for iron ore, but since the traffic has grown too vast for its congested harbor, the ports of Lorain, Fairport Harbor, Conneaut, and Ashtabula have sprung up to meet the need, while farther to the west Huron, Sandusky, and Toledo have great docks where ore cargoes are exchanged for coal. The state's chief mineral is bituminous coal, obtained from Appalachian coal fields in the east and southeast.

Other important mineral products of Ohio are petroleum and natural gas, although the petroleum flow has greatly diminished. At one time Ohio supplied 39 per cent of the nation's total output, but at present Ohio's share is less than one per cent. Although the natural gas fields in the eastern, central, and northwestern parts of the state have long been in operation, the flow keeps up to the extent of over 40,000,000,000 cubic feet per year.

Ohio is essentially a manufacturing state, ranking third or fourth among the states in recent years. In the manufacture of foundry and machine shop products, rubber tires and tubes, ornamental ironwork, and pottery, Ohio ranks first (though any such ranking among the states is likely to vary from year to year); and it is second in iron and steel, motor vehicles, and clay products. Also of much importance is the packing industry. The first western packing establishment

was founded about 1818 in Cincinnati, thereafter facetiously known as "Porkopolis," and until 1850 it was the most important packing city in the Union. Today Cincinnati is one of the country's leaders in the radio industry.

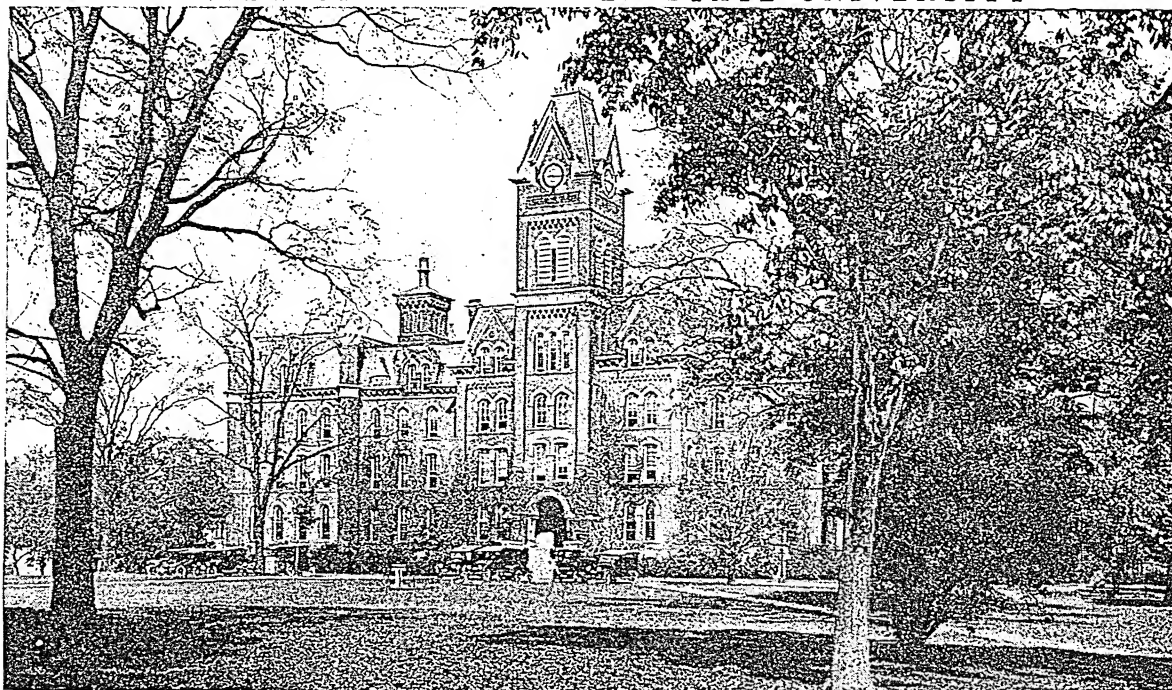
Another industry notable for both age and importance is flour-milling. In the early 19th century, boats were carrying Ohio meal and flour, as well as pork and beef, down the Ohio and Mississippi rivers. Today Ohio still stands among the leading states in the value of its flour and gristmill products.

Far greater in value, however, are the clay products. An immense amount of white ware is made in Cincinnati, Zanesville, and East Liverpool. In fact, East Liverpool manufactures nearly half of all the white granite ware and semivitreous porcelain used in the United States. The art wares of Coshocton and Zanesville and the Rookwood ware of Cincinnati are known all over the world. Canton has large factories of enameled ware, as well as pressed metal products.

The rubber goods and cereals of Akron, the automobiles of Cleveland and Toledo, the cash registers and electrical apparatus of Dayton, and the matches of Barberton are distinctive products. Other important manufactures are printing, bakery goods, men's clothing, paper, foodstuffs, butter, cheese, evaporated milk, coke, airplanes, and glass.

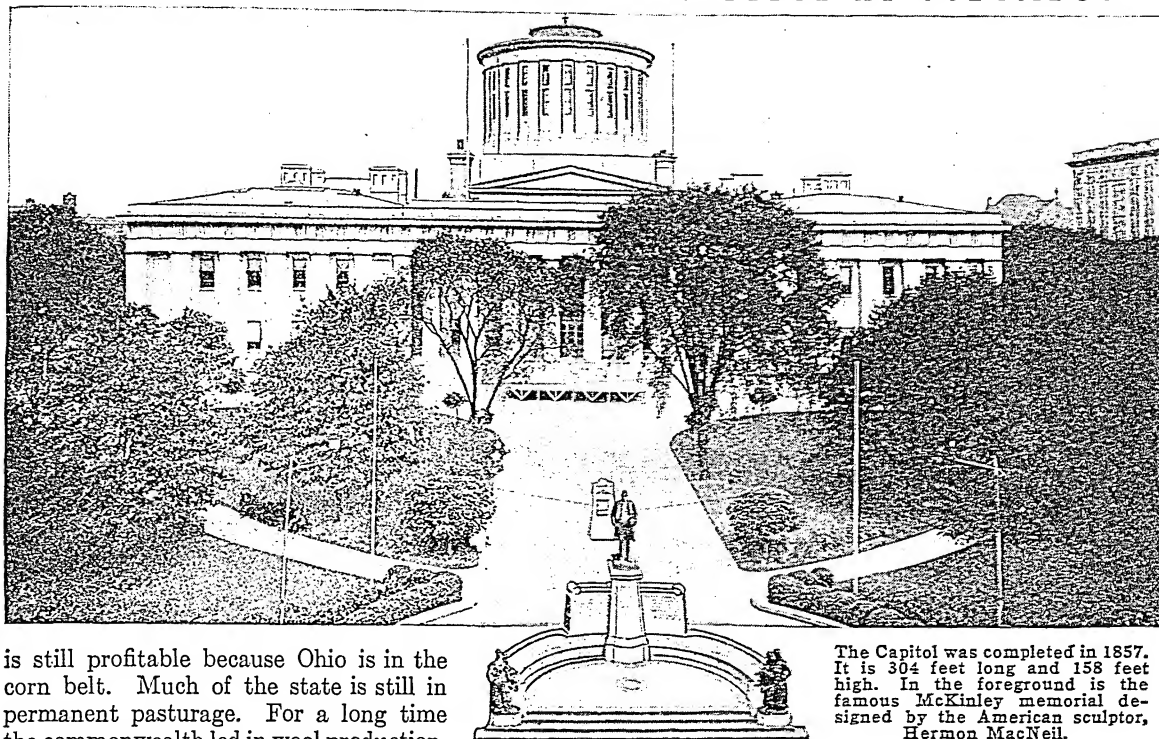
The state devotes 85 per cent of its land to farms, which raise corn, hay, wheat, oats, potatoes, apples, tobacco, barley, peaches, and pears. Dairying and poultry-raising bring in millions each year, and pork-raising

A VIEW OF OHIO'S NOTED STATE UNIVERSITY



University Hall, which you see here, is one of the older buildings of Ohio State University at Columbus. The university was founded in 1870. It is supported partly by proceeds from a land grant made by the Federal government in 1862, and by further annual grants since 1890, and partly by annual grants and special donations from the state.

THE WEST FRONT OF THE STATE CAPITOL AT COLUMBUS



is still profitable because Ohio is in the corn belt. Much of the state is still in permanent pasturage. For a long time the commonwealth led in wool production.

Now, however, the wool-growing center has passed to Western states, though Ohio is still an important producer of fine grade wools.

A romantic episode in Ohio horticulture is the story of grape culture in the state. In the first half of the 19th century, Nicholas Longworth, a Cincinnati banker and merchant, spent a fortune and 40 years of his life in the attempt to establish vineyards on the Ohio. From Bordeaux, Burgundy, Madeira, the Rhine, the Jura, and various parts of America he brought vines, but not until in 1825 he tried the Catawba vine from North Carolina did he find one that would thrive on the banks of the Ohio. Longfellow, after a visit to "the father of American grape culture," celebrated "the wine of the West, that grows by the Beautiful River." But following the destruction of the surrounding forests, mildew and rot fell upon the vineyards of the Ohio in the 1850's and '60's and exterminated them. The Catawba grape, however, found a refuge on the Ohio shores and islands of Lake Erie, where, with other American grapes, it flourishes over a total vineyard area of about 10,000 acres.

Like its manufactures, the agriculture of the state has been made profitable by the development of transportation. In the early days there was no profit to the farmer in the interior from raising anything which could not be sent part way to market—at least as far as the river's banks—on its own legs; hence the early importance of the grazing industries. Before the opening of the Ohio and Erie Canal,

grains were practically worthless along its route; corn sold for 10 cents and wheat for 25 cents a bushel. Now, of course, the presence of numerous manufacturing towns and cities gives the farmer a ready market near at hand.

The foundation of Ohio's agricultural prosperity, however, was laid thousands of years ago in the Ice Age, when the Laurentian glacier rested a vast white paw over the greater part of what is now the state of Ohio, leaving its muddy footprint when it withdrew. The glacial mud and gravel chokes the ancient river valleys, and the rivers today flow in channels sometimes a hundred feet or more above their former beds. A buried channel more than 500 feet deep has been discovered near St. Paris, Champaign County. Northern and western Ohio, in preglacial times a network of river gorges and valleys, has been plastered over with glacial drift to form a relatively level plain, like "a checked and worm-eaten plank which a carpenter has filled with putty." The practically inexhaustible Ohio clay deposits are partly of glacial origin, but the glacier's supreme gift was to agriculture. The glacial soil covering three-fourths of the state includes the best Ohio farm lands. The unglaciated soil is good where it has a limestone basis, or lies in the river's flood plain, but the development of the southeastern rim of the state, untouched by the glacier, lagged behind the glaciated portion until the discovery of coal in the unglaciated region.

This southeastern rim, gradually dropping down from the Allegheny plateau region, is still rugged

The Capitol was completed in 1857. It is 304 feet long and 158 feet high. In the foreground is the famous McKinley memorial designed by the American sculptor, Hermon MacNeil.

and hilly, as the whole of Ohio was before the Ice Age. The Lake Erie border is circled by level plains, and a line of low hills, running from below the north-east corner to a little below the middle of the western boundary, turns the northern streams toward Lake Erie and those on the southern side into the Ohio River. When white men first saw it, all this region, except for little patches of open prairie, was overgrown with dense forests of oak, hickory, buckeye, walnut, etc. The buckeye or horse chestnut, most numerous of the native trees, gave its name to the "Buckeye State."

Some of Ohio's Famous Citizens

But after all, the pride of Ohio is not so much in its commerce, manufactures and agriculture as in its citizenship and the number and character of the noted men and women it has produced. "These are my jewels," said the mother of the Gracchi, pointing to her sons; and this is the inscription on a monument in the capitol grounds at Columbus. The list of Ohio's distinguished citizens, in addition to those who have become famous as statesmen, includes soldiers like Grant, Sherman, Sheridan, and Custer; inventors like Thomas A. Edison, C. F. Brush, and Wilbur and Orville Wright; novelists like William Dean Howells, Constance Fenimore Woolson, and Albion W. Tourgee; journalists like George Kennan, Whitelaw Reid, and J. A. MacGahan; humorists like Artemus Ward and David R. Locke (Petroleum V. Nasby); poets like Edith Thomas and Alice and Phoebe Cary; historians like W. M. Sloane and James Ford Rhodes; sculptors like J. Q. A. Ward and Hiram Powers; and painters like Frank Duveneck and Kenyon Cox.

It is not chance that has produced this splendid record. A free state by the terms of the Ordinance of 1787, Ohio from the first drew from the best elements of all the older states. Its educational and social institutions are worthy of the state's founders. The Ohio State University is at Columbus. Ohio University, at Athens, is the pioneer institution of higher learning in the "Old Northwest," and the state supports also Miami University, at Oxford. Western Reserve University, at Cleveland, has been called the "Yale of the West." Oberlin, the first coeducational college in the United States, bore a notable part in the abolition movement. The University of Cincinnati is one of the foremost municipally supported universities. Some of the city schools and centralized rural schools of Ohio are among the best in the Union. An excellent system of county school organization was adopted in 1914. Ohio has a tremendous foreign-born population, and Cleveland claims more Hungarians than any other city outside of Hungary. Though not inclined to wild radicalism, the state has been a leader in certain lines of advanced social and industrial legislation and administration, such as the promotion of safety in factories. The initiative, referendum, and recall have been a part of the state constitution since 1912.

The first settlement in Ohio was made in 1788, when Marietta, at the mouth of the Muskingum River, was founded by "The Ohio Company of Associates," composed chiefly of New England Revolutionary soldiers under the direction of Gen. Rufus Putnam. The same year saw the founding of Cincinnati, which at first rejoiced in the astonishing name of "Losantiville"—a mongrel compound designed by its school-master inventor to mean "the town opposite the mouth of the Licking"—"os" meaning mouth and "L" standing for the river. In 1796 a company of Connecticut men founded Cleveland in the Western Reserve—a strip of land along the lake in the north-east which was reserved by Connecticut when she surrendered her claims to western lands (*see Connecticut*). By the end of the 18th century 15 thriving towns had sprung up, and the tide of immigration was flowing so strongly into the Ohio region and other parts of the Northwest Territory that a territorial legislature was established in 1799 (*see Northwest Territory*). In 1803 Ohio was admitted to statehood.

For many years the northern boundary of Ohio was uncertain, both Ohio and Michigan claiming a strip of land 470 square miles in extent, which included the lake port of Toledo. The controversy culminated in 1835 in the so-called "Toledo War," when the militia of both states were called out and a conflict for a time seemed imminent. The following year Congress awarded the disputed territory to Ohio and gave Michigan in compensation the rich mineral and agricultural region known as the "Upper Peninsula" (*see Michigan*).

Being settled mainly from the North and being a non-slavery state by the terms of the Ordinance of 1787, Ohio was a stronghold of the abolition movement. Large numbers of slaves who escaped across the Ohio River were aided to make their way to Canada by the system known as the "underground railroad" (*see Slavery and Serfdom*). When the Civil War broke out, Ohio played an important part in furnishing men and supplies. Her part in subsequent conflicts has also been notable.

OHIO RIVER. Of the two great tributaries that flow into the Mississippi, the Ohio, though shorter in length, is vastly more important than the Missouri. Its navigable waters traverse almost 1,000 miles of the greatest industrial and farming district in the United States, furnishing means of transportation for many of the raw and manufactured products of the region. It serves such mighty industrial centers as Pittsburgh, Wheeling, Cincinnati, Louisville, and other thriving cities and taps the extensive coal and oil fields that lie on both sides of its course. Fleets of barges and steamboats ply up and down the river, laden with coal, petroleum, lumber, grain, pottery, and iron and steel products. Two canals, now fallen into decay, once connected it with Lake Erie—the one from Portsmouth, Ohio, by way of Columbus to Cleveland, and the other from Cincinnati by way of Dayton to Toledo.

This useful and picturesque river is formed by the junction of the Allegheny and Monongahela rivers at Pittsburgh in Pennsylvania. It flows thence in a southwesterly direction until it finally reaches Cairo, where it joins the Mississippi. It forms the northwestern boundary of West Virginia, the northern boundary of Kentucky, and the southern boundaries of Ohio, Indiana, and Illinois. Its waters are gathered from the tributaries which drain the neighboring country—the Muskingum, Scioto, Miami, and Wabash from the north, and the Kanawha, Big Sandy, Licking, Kentucky, Green, Cumberland, and Tennessee rivers from the south.

In summer, away from the smoke of the bustling cities, the Ohio presents a pleasing aspect, sweeping in majestic curves through the fertile grain fields and wooded hills, turning and re-turning until its twisted course almost encircles certain spots. Numerous islands, some under cultivation, divide the waters of the shining river. Of these the most famous is Blennerhassett, connected with Aaron Burr's conspiracy, near Parkersburg, West Virginia. In early spring the red-brown waters of the mighty stream, fed by the foaming torrents that bear away the melting mountain snows, swell to an angry tide, devastating the bottom-lands and inundating lower parts of the cities.

Formerly the course of the river was impeded by falls, sandbars, and snags, and from June to Novem-

ber the waters were too low for navigation by craft of any size. But now, after the expenditure of more than \$100,000,000 through a period of nearly 20 years, the Ohio is virtually one long canal, with a channel nine feet deep and a width varying from 890 feet near Pittsburgh to 5,910 feet near its mouth. There are 50 dams and locks, and at the Ohio Falls near Louisville, Ky., the chief navigation hazard has been removed by a \$10,000,000 navigation-power dam which sends nearly all the water of the river either through a canal around the falls or through a hydroelectric plant. The river carries more than 20,000,000 tons of freight a year. Its average flow is 3 miles an hour and the average volume is 158,000 cubic feet a second.

It is to La Salle that we probably owe the discovery of the Ohio, in about 1670, when he is supposed to have descended it at least as far as the present site of Louisville. The river remained little known until the middle of the 18th century, when it became important in the struggle for the interior between the French and English, the English eventually gaining control (1763). After 1768 settlers from Virginia followed this course into the new country. Ten years later George Rogers Clark set out from the falls at Louisville for the conquest of Forts Kaskaskia and Vincennes. In 1783 the whole Ohio country became a part of the United States and in 1787 the organization of the Northwest Territory opened the whole region to settlers. The first great tide of western immigration swept along this course. The first steamboat descended the river from Pittsburgh in 1811, and thenceforth to the Civil War the steamboat traffic of the Ohio was a dominant factor in the industrial life of the Middle West.

INDIANS *and* WHITES in OKLAHOMA'S HISTORY



OKLAHOMA. Youthful, vigorous Oklahoma—it sprang full-grown into being! For half a century the tide of white immigration surged about its boundaries without being able to enter; and then in 1889 the Federal government first opened the gates, and the flood poured in. Until that date the entire country was known as "Indian Territory"—a country reserved as a last home for various tribes of redmen who had been driven from the Southern and Western states. Only a small portion in the center remained unassigned to them—the original "Oklahoma," which in the Choctaw language means the "Land of the Red Man." Toward this portion of the public domain the whites cast covetous eyes, and finally Congress

Extent.—East and west, about 470 miles; north and south, 230 miles. Area, 69,919 square miles. Population (1940 census), 2,336,434.

Natural Features.—Rolling plain merging in the Great Plains in the west; Ozark Mountains in northeast, Ouachita in southeast, Wichita in southwest; Red River (forming southern boundary) and its tributary, the Washita; the Arkansas and its tributaries (Canadian, Cimarron, Neosho). Mean annual temperature, 60°; mean annual precipitation, 33".

Products.—Cotton, wheat, corn, hay, potatoes, sorghum; cattle and dairy products, poultry, hogs; petroleum, gas, zinc, lead, coal, gypsum; petroleum products, flour and mill products, refined zinc, meat.

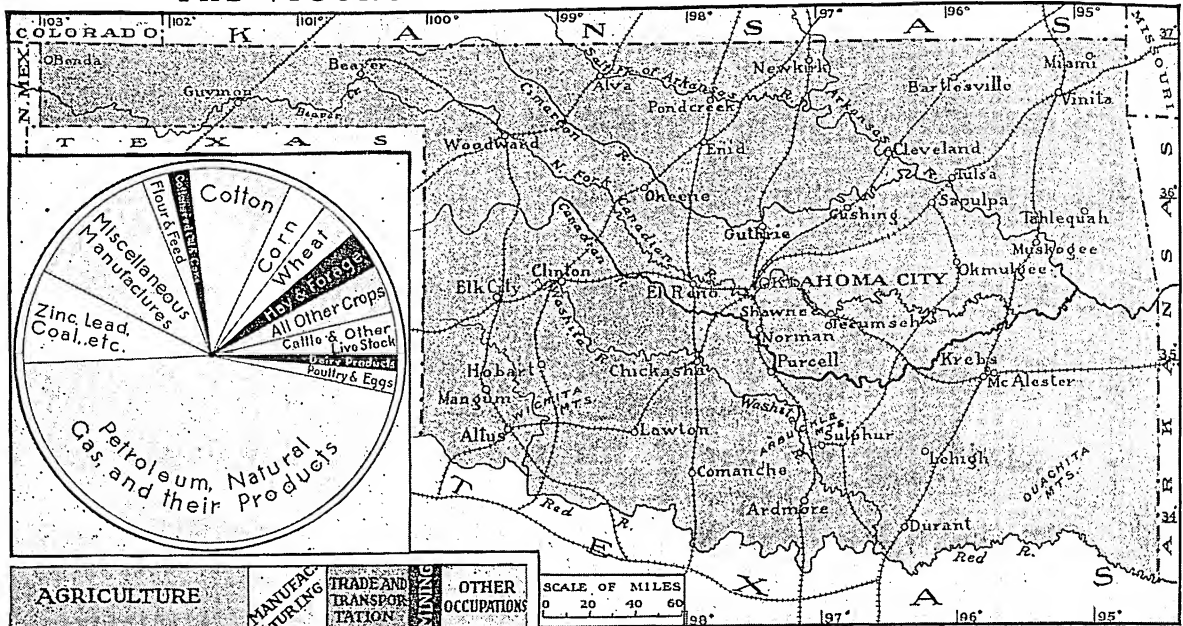
Cities.—Oklahoma City (capital, 204,424), Tulsa (142,157); Muskogee, Enid, Shawnee, Lawton, Ardmore, Ponca City, Okmulgee.

set April 22, 1889, as the day upon which white settlers might enter to stake out homestead and other claims.

For weeks home seekers had been gathering, and on the great day thousands of human

beings were massed along the frontier, kept back from the promised land by troops of the United States army, waiting for the gunshot which should start the race for land. Some had put all their money into obtaining the best horses they could find, and were mounted and ready. Some were lucky enough to have passage engaged on the Santa Fe railroad, the only line that then penetrated the Oklahoma country. Others were in carriages, or on ponies and mules, and many were afoot. Families

THE VIGOROUS YOUNG STATE OF OKLAHOMA



From its highest point, in the extreme northwest corner, near the Colorado border, Oklahoma slopes gently downward to the south and southeast, where the Red River reaches the Gulf Coastal Plain at an elevation of only about 400 feet above sea-level. This great shelving plain is broken by a few highland areas—the Wichita Mountains in the southwest, the Arbuckle Mountains in the south central portion, and the Ouachita Mountains along the eastern border. The entire southern boundary is formed by the Red River. At the left of the map you see how the chief products of the state rank, and the leading occupations.

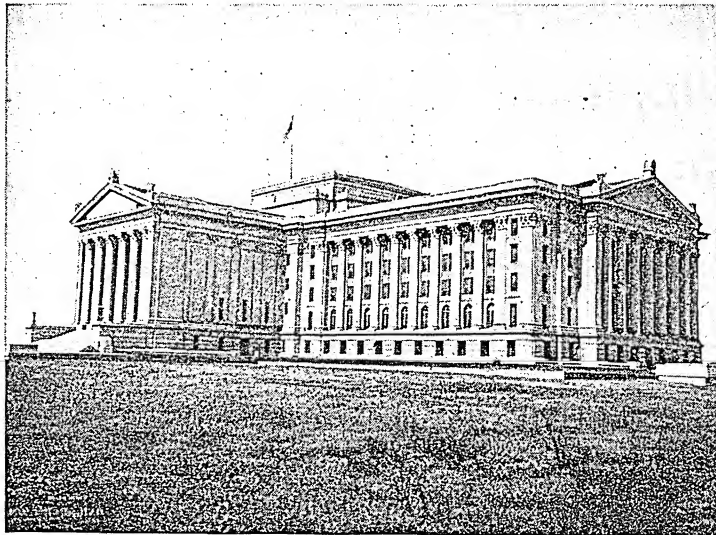
who had been living for weeks in their canvas-covered wagons tied their belongings tightly on and waited with reins grasped ready for the dash. Before the gunshot smoke had cleared away the leaders in the "Oklahoma run," as it was called, were almost out of sight. The multitude followed, spreading out over woodland and prairie, staking their claims here and there. On that first day Guthrie and Oklahoma City were born. Towns sprang up between breakfast and supper, and in a week a new commonwealth had been created. Settlers continued to pour in from neighboring states, but for nearly a year there was no government, until in March 1890 the western half of the present state was organized as the Territory of Oklahoma.

From then on, Oklahoma grew with a rush that reads like a fairy story. New areas were opened for

settlement at various times, and the population increased at an extraordinary rate. To increase the land available for settlement the Federal government made individual allotments to the Indians and bought the surplus land in their reservations—much of it for as low as 15 cents an acre. Several more "runs" occurred, until the competition for the claims became so keen that it was decided to assign them by drawing lots. Oil fields had been discovered in Indian Territory, the eastern half of the present state, as early as 1890, but there was little attempt at development until 1903, when the big "oil boom" began. After years of agitation for statehood, Indian Territory and Oklahoma Territory were admitted to the Union as the 46th state on Nov. 16, 1907.

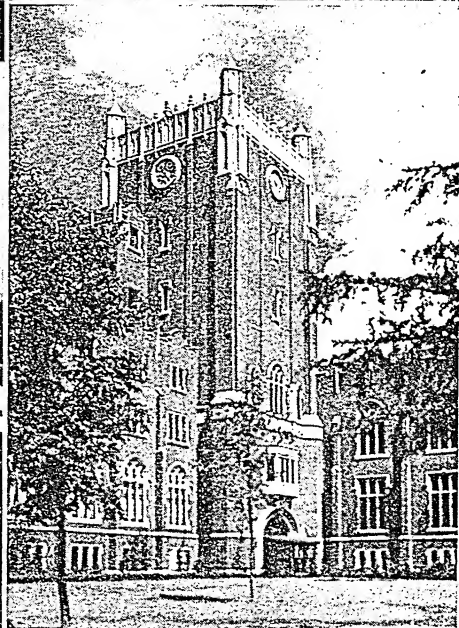
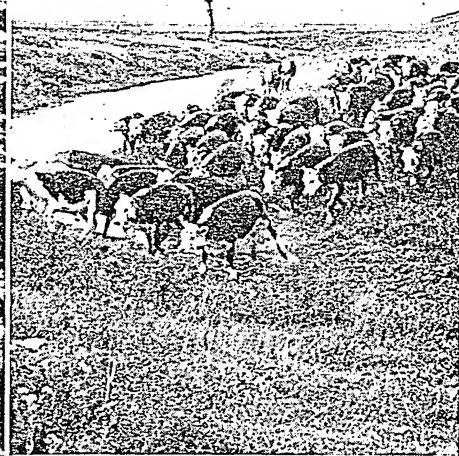
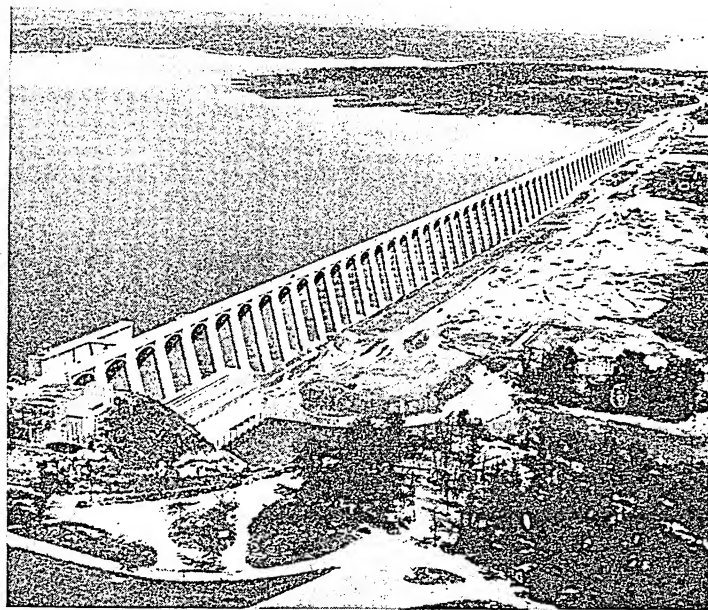
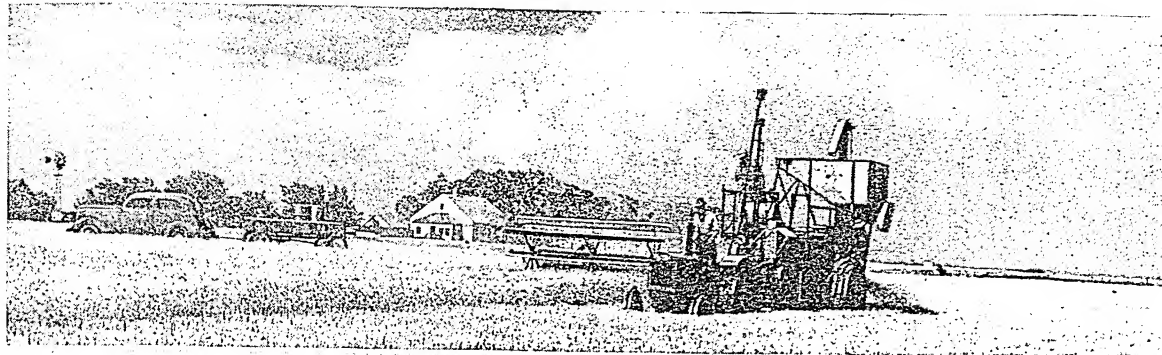
As is indicated by the eastward-flowing Arkansas and Red rivers, the surface of Oklahoma is in general

THE STATE CAPITOL AT OKLAHOMA CITY



The progressiveness of this youthful commonwealth is well symbolized by the magnificence of the building that houses its governmental machinery.

A REGION OF VAST RESOURCES



On the level prairies of northwestern and central Oklahoma are great tractor-operated wheat farms, such as the one shown in the top picture. The \$23,000,000 Grand River power dam (left center), completed in 1941, opens new possibilities for the state's industrialization. The cattle ranch (right center) is characteristic of southern and western Oklahoma. At the lower left we see the impressive sky line of Tulsa, with the oil refineries in the foreground which have helped to make the state a leader in petroleum production. The Union Building of the University of Oklahoma, at Norman, is at the lower right.

a gradual slope to the southeast, forming a part of the great Mississippi basin. At the western end of the long "Panhandle," where the Rocky Mountain plateau enters the state, the altitude reaches 5,000 feet; but in the extreme east, the valley of the Red River goes as low as 300 feet above sea level. Hills frequently interrupt this long slope; in fact, it is really level only in the western part and in a belt running through the center of the state from north to south. In the northeast the mineral-bearing Ozarks edge over from Arkansas. The Arbuckle Mountains with their woods and waterfalls break the plains in the middle south, and in the southeast the Ouachitas present a group of high rugged hills. In the southwest the rough granite peaks of the Wichita Mountains rise in places 900 feet above the surrounding lowlands. Here is the Wichita National Forest and Game Preserve, with herds of buffalo, elk, white-tailed deer, antelope, and flocks of wild turkeys. Platt National Park in the south is noted for its sulphur and other medicinal springs. Yellow pine, hickory, oak, and red gum are cut in the eastern forests of the state.

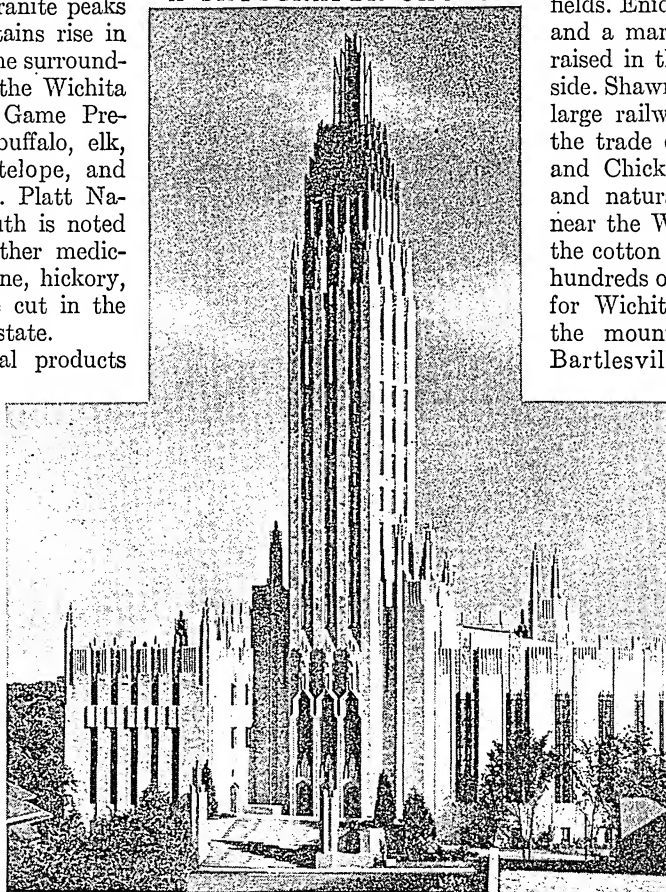
Although agricultural products long provided the bulk of Oklahoma's wealth, minerals have recently taken first place. However, over two-thirds of the total area is farm land, and because of the great range in elevation, temperature, and rainfall, there is a wide variety in crops. Cotton, winter wheat, and corn, the three chief agricultural products, are seldom to be found in the same region, but they all thrive in Oklahoma, which is often the second winter wheat state in the Union and ranks first in broom corn. Other chief crops are kafir, alfalfa, sorghum, peanuts, oats, hay, barley, rye, pecans, tobacco, potatoes, green vegetables, and fruits. The Panhandle plateau is fertile, and although it has less rainfall than other parts of the state, it raises large crops of wheat, barley, hay, and sorghum, and pastures great herds of cattle. Cattle, hogs, and poultry are raised extensively throughout the state, and dairying is a thriving industry contributing to Oklahoma's wealth.

However, large as is the total wealth from agriculture, the development of the oil industry is the magic which has in a few years transformed little "one-street" villages into brisk new cities with skyscrapers and busy streets. Tulsa, called "The Millionaire City" because of fortunes made in near-by oil fields, has one of the most amazing "mud-to-macadam" records. Less than three decades ago a prairie village, it is now one of the world's greatest oil centers (see Tulsa). Oklahoma City, the capital, is the leading manufacturing and distributing center of the state. Muskogee, once capital of the Five Civilized Tribes—the Cherokee, Choctaw, Chickasaw, Creek, and Seminole—is in the middle of oil fields. Enid is both a grain market, and a market for pure-bred stock raised in the neighboring countryside. Shawnee, an oil town, also has large railway shops. McAlester is the trade center of the southeast, and Chickasha is a cotton, corn, and natural gas center. Lawton, near the Wichita Mountains, is in the cotton and oil country and has hundreds of summer visitors bound for Wichita National Forest and the mountain resorts. Ardmore, Bartlesville, Cushing, Guthrie, Okmulgee, Sapulpa, Ada, Ponca City, Blackwell, Wewoka, and Seminole are all cities that owe their rapid growth largely to the oil industry.

The oil wealth comes chiefly from the northeastern and east central parts of the state, which is one of the world's greatest oil regions. Oklahoma ranks among the first three states in petroleum output. Much coal is found in eastern Oklahoma, and lead and zinc in the northeast. Asphalt, clay, limestone, granite, marble, gypsum, salt, potash, and other minerals exist in workable quantities. In zinc and natural gas, Oklahoma leads all other states. Petroleum refining is the chief industry, and great quantities of oil are piped to refineries in other states. Flour, cottonseed products, smelted and refined zinc, foundry products, printed matter, baked goods, and butter are other manufactures.

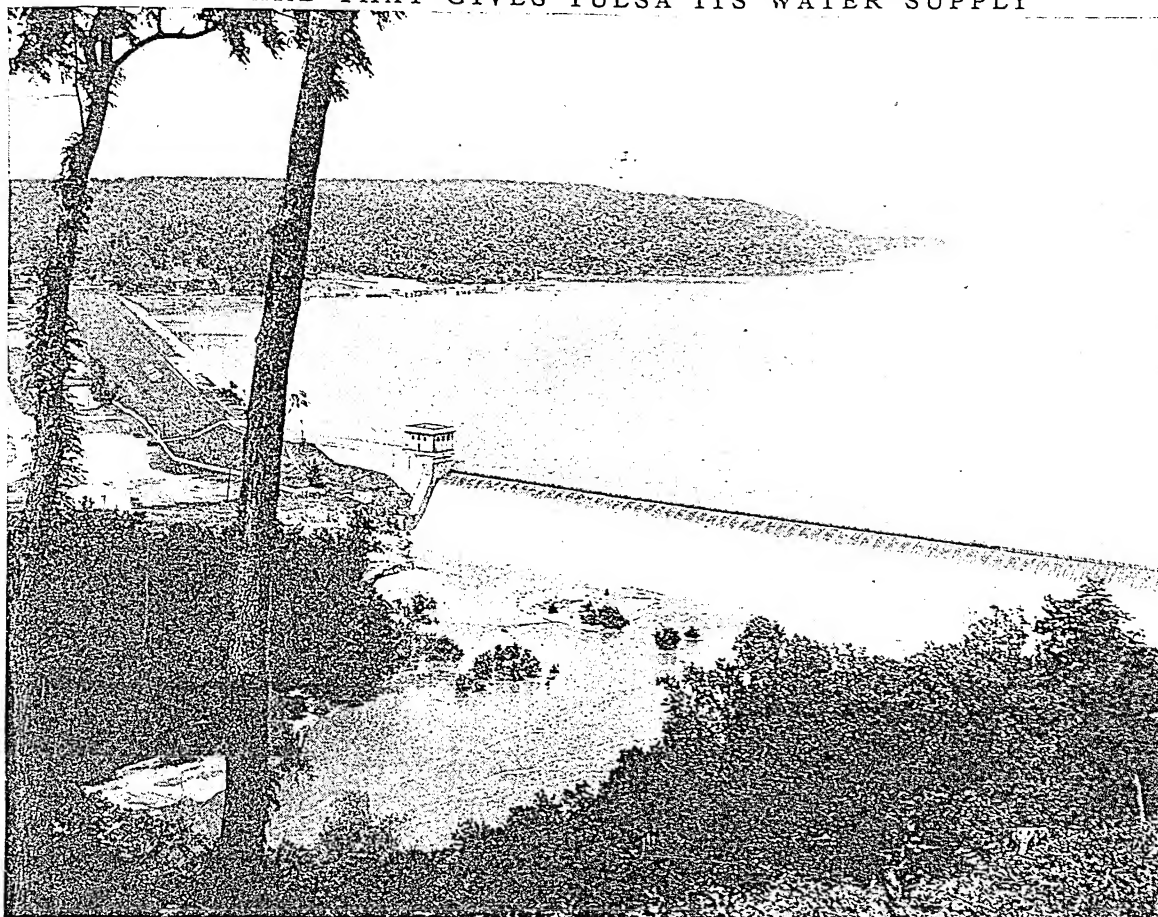
Oklahoma's appropriation for schools draws generously from public lands and from a \$5,000,000 fund

A SKYSCRAPER CHURCH



Only a few years ago Tulsa was a "cow-town" and an Indian trading post. Now it has such architectural triumphs as the Boston Avenue Methodist Church, a striking example of the modernistic in ecclesiastical buildings.

THE LAKE THAT GIVES TULSA ITS WATER SUPPLY



Lake Spavinaw, a reservoir 60 miles east of Tulsa in the Ozark Hills, furnishes the city with all its water. Though the difference in elevation is only 90 feet, the water is brought the entire distance by the force of gravity alone. During the peak months 23 million gallons of water are consumed daily, with no appreciable drop in the lake level.

started when Oklahoma became a state. Whites and blacks attend separate schools. Besides the state university established at Norman in 1892, Oklahoma has an agricultural and mechanical college at Stillwater, Oklahoma City University, Eastern Oklahoma College at Wilburton, Oklahoma Baptist University at Shawnee, Phillips University at Enid, University of Tulsa at Tulsa, Colored Agricultural and Normal University at Langston, and several teachers colleges.

Oklahoma was all part of the Louisiana Purchase, except the long narrow strip in the northwest. This strip originally belonged to Texas, but when Texas entered the Union as a slavery state, this part of its "Panhandle" had to be ceded, because it was north of the Missouri Compromise line of $36^{\circ} 30'$ of latitude. Until 1890, when it was included in Oklahoma Territory, it was a part of the public domain popularly called "No Man's Land."

The Spaniard Coronado in 1541 hurried through Oklahoma in quest of the fabled riches of Quivira, and the Frenchman de la Harpe camped here in 1719. The first important steps in Oklahoma's political growth came in 1820, when the first treaty was made

with the Choctaw; and later, between 1825 and 1836, when the Five Civilized Tribes were moved from Georgia, Alabama, Mississippi, and Florida into what is now Oklahoma. Many young West Point graduates, among them Jefferson Davis, were stationed at Fort Gibson, built in 1824 near Muskogee; and girls came by horseback from 100 miles away to dance at the military balls. Fort Towson was built the same year in the east, near Red River. Wagons and pack trains wore deep ruts in the old Santa Fe trail, marked across northwestern Oklahoma in 1825.

Washington Irving, who hunted in this country in 1832, wrote of it in his "Tour of the Prairies": "In the oft-vaunted regions of the far West . . . there is to be seen neither the log house of the white man nor the wigwam of the Indian. . . . Over these fertile wastes still roam the elk, the buffalo, and the wild horse in all their native freedom. These are the hunting grounds of the tribes of the far West."

Formation of "Indian Territory"

In 1830 this region was recognized by Congress as part of the "unorganized or Indian territory." The Indians who had found a new home here gave many

evidences of progress, establishing courts and schools, improving their farms, and setting up governments for themselves not unlike those of the states of the Union. The Sequoyia of the western Cherokee had invented an alphabet for their language.

Many of the Indians owned slaves, and in the Civil War troops from Indian Territory were enlisted by both sides. At the end of the war, the tribes were compelled to cede back to the United States much of their western territory, and many tribes from the western plains were established there, including the Cheyenne, Arapaho, Comanche, and Pawnee. Sheridan, Custer, and McClellan had campaigned in the Wichita Mountains in 1850-60 against the Wichita, Comanche, and Kiowa. For years before his death in 1909, the Apache chief Geronimo was held prisoner near Lawton at Fort Sill, now a field-artillery school.

Discovery of oil on tribal lands has made many Indians wealthy. Their income now, however, is declining. Since all mineral rights are held in common, all members of the tribes share the revenues from the oil wells. The majority of the 100,000 Indians in the state are members of the Five Tribes, and they own property valued at over \$300,000,000. Many of the full-blooded Indians still cling to their old customs and ceremonies.

After 1867, cattle pounded up through Indian Territory from the breeding grounds of Texas over the old Chisholm Trail to Abilene, Kan., for shipment to Chicago. "Cattle kings" leased grazing grounds from the Indians, and were surly to the "boomers" who kept trying to colonize the country even though white settlement was forbidden. President Hayes had to call troops to drive out these homesteaders, of whom Capt. David L. Payne (1836-1884), the "Cimarron Scout," was a ringleader. On

April 22, 1889, 100,000 home-seekers rushed in to stake out their claims on the coveted public lands.

A territorial government was established the next year. When statehood began to be considered, the Five Tribes made efforts to form a separate state, but they finally joined with Oklahoma Territory in 1907 to make the present state of Oklahoma. The capital was established at Guthrie, but was later moved to Oklahoma City. Citizens with Indian blood have taken a prominent place in the affairs of the state. They sat in the convention that drew up the state constitution in 1906 and have been elected to the state and the national legislatures.

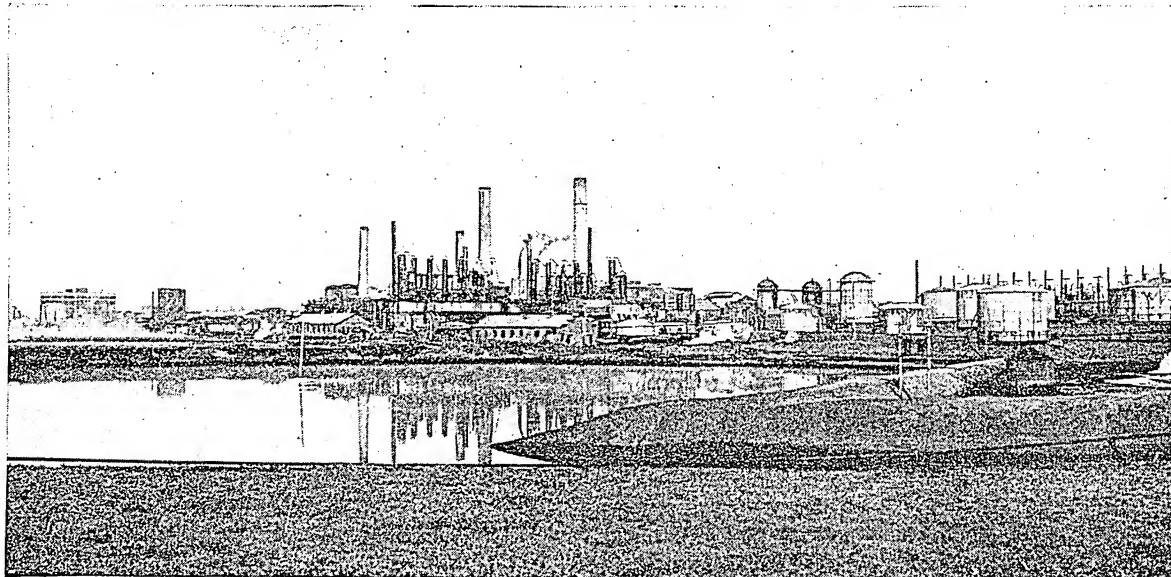
The constitution, which is unusually long and mentions many matters ordinarily left to law in older states, provides for the initiative and referendum, direct primaries for the nomination of all public officers, employers' liability, and the restriction of child labor. Indians may vote only after abandoning their tribal connections. The governor serves four years and may not succeed himself. State senators are elected for four years, and representatives for two years.

Patrick J. Hurley, secretary of war under President Hoover, was born in Indian Territory, as was Will Rogers, humorist.

OKLAHOMA CITY, OKLA. The first day that the Oklahoma country was thrown open to settlement, April 22, 1889, three thousand men poured into Oklahoma City. It has grown in the few decades since into the largest city in the state. It has been the capital since 1910.

"Oil" is written in big black letters in the history of the community. The city stands above a vast, deep-lying pool of petroleum, ranked as one of the richest on the continent. Wells have been drilled at the very doors of the capitol to tap this flowing wealth. The

THE CITY THAT "GREW" IN A SINGLE DAY



Since April 22, 1889, when 3,000 home-seekers poured into the settlement later to become Oklahoma's capital, Oklahoma City has become one of the world's important oil centers. One of its many refineries is pictured here.

OLEANDER

many large oil and gas companies which make their headquarters here have helped to build and fill the skyscrapers that form an impressive sky line. Oil refining and the manufacture of oil-well equipment are important industries. The use of natural gas in industrial plants and in homes keeps the city clean.

The products of the surrounding stock-raising and farming area are the basis of the other chief industries — meat packing, flour milling, and cotton ginning. Situated in the center of the state, with railroads, highways, and airlines radiating in all directions through the central Southwest, the city is one of the chief distributing centers of this productive region.

A city-manager government was instituted in 1927, which put municipal expenditures on a cash operating basis. Oil wells on city-owned land help keep taxes low by contributing large revenues. During the 1930's, a civic center, consisting of city and county government buildings and an auditorium, rose to beautify six blocks of the business district once occupied by railroad tracks.

Oklahoma City University, the Medical School of the University of Oklahoma, and Mount St. Mary's Academy bring many students to the city. A few miles away are the University of Oklahoma and Central State Teachers College. Population (1940 census), 204,424.

OLEANDER. Its glowing clusters of roselike flowers, rising above long dark leathery lance-shaped leaves, make the oleander one of the handsomest of flowering shrubs. But be careful how you handle it, for the leaves when broken exude a milky juice which, like most other milky plant juices, is poisonous. Children have been badly poisoned by handling this tall evergreen shrub, and it is said that British soldiers in Spain during the Peninsular War died after roasting meat on freshly cut oleander twigs. The common oleander, a native of the Mediterranean region and of tropical and subtropical Asia, is found

OLEOMARGARINE

now in many countries both as a house plant and as an ornamental out-of-door shrub.

The oleander belongs to the dogbane family (*Apocynaceae*). Scientific name of common oleander, *Nerium oleander*. The upper edge of the corolla is fringed in petal-like scales; there are five short stamens, and the anthers are tipped with a hairy bristle. The seeds in the spindle-shaped pods are tufted with silky hairs like thistledown.

OLEOMARGARINE. A prize was offered by the French government at the time of the Franco-

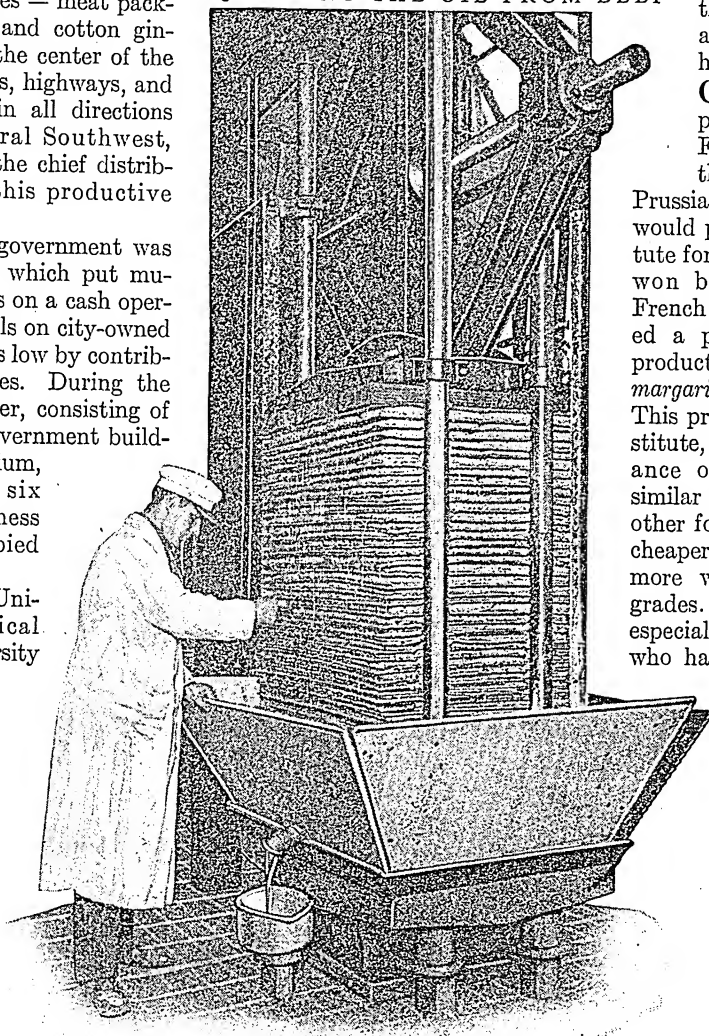
Prussian War to anyone who would produce a good substitute for butter. The prize was won by Mege-Mouries, a French chemist, who originated a process for making a product from beef fat called *margarine* or *oleomargarine*. This proved to be a real substitute, for it had the appearance of butter, contained similar amounts of fat and other food elements, and was cheaper than good butter and more wholesome than poor grades. It was a real boon especially to the peasant class who had been obliged to do

without sufficient edible fats or use only cheap and unwholesome butter. Its use spread rapidly in the countries of Europe. Later, methods were devised for making margarine at still lower cost from vegetable fats. This is called "vegetable oil margarine" or "nut margarine."

In recent years it has largely replaced animal margarine as a butter substitute. Coconut oil is used more than any other vegetable fat in making margarine, with cottonseed-oil, peanut oil, and soy bean oil next in importance.

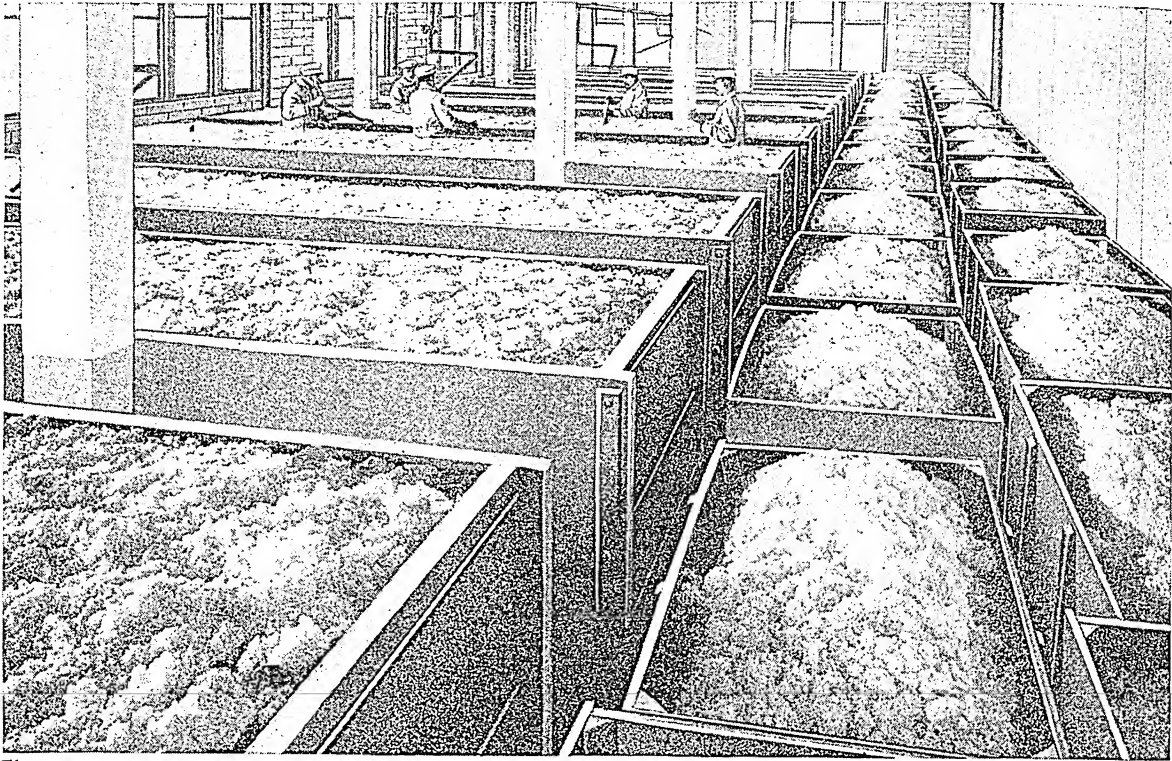
About 75 per cent of the margarine produced in the United States is of the vegetable type. Much of the remainder is a mixture of vegetable and animal margarine. The animal fats used are oleo oil (refined beef fat) and neutral fat (leaf fat of pork). The an-

SQUEEZING THE OIL FROM BEEF

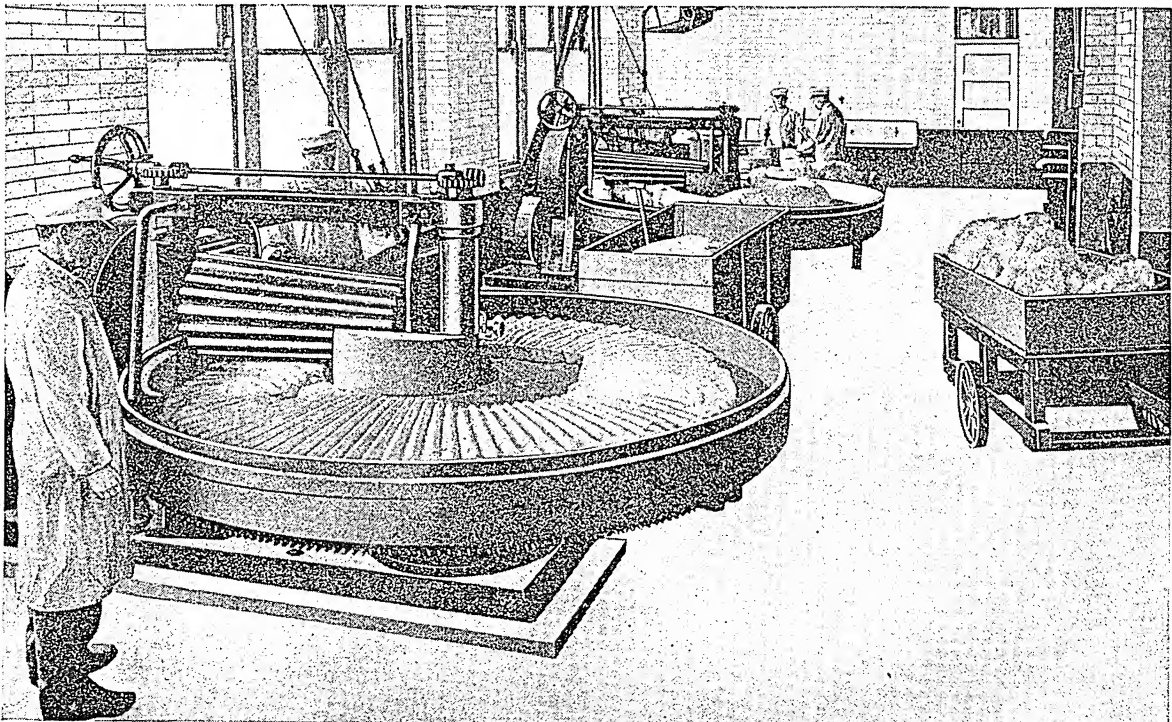


To get the oil for making oleomargarine, huge presses like this squeeze the beef fat. You can see the oil running out of the pan.

WHERE OLEOMARGARINE IS MADE BY THE TON



These great vats are filled with neutral fat destined for use in the finished product. The "neutral" is kept here until it is properly seasoned, and then is mixed with milk, cream, and other ingredients. The mixture is churned to produce the "oleo," and in the churning becomes smooth and soft like butter.



Here great corrugated rollers are working over the material that comes from the churn. Round and round the pans go beneath the rollers, slowly squeezing out the buttermilk and surplus moisture, and working salt through and through the oleomargarine. When the rollers have finished the oleomargarine is ready to be tested and packed into bricks and tubs for the market.

nual production of all kinds of margarine in the United States amounts to more than one-fifth of the butter production.

How Margarine Is Prepared

The manufacture of oleomargarine starts with the refining of the fats or oils until they are tasteless. To these is added pasteurized skim milk which has been ripened or soured in a pure culture. The milk gives margarine its butter flavor. The milk and fat are churned together in glass-lined churns or other suitable containers, until a complete emulsion is formed. Then the creamy mixture is chilled to crystallize the fats. This is usually accomplished by pouring it over ice water. The mass is then skimmed off the water and taken to a "worker" which removes excess water and kneads in the salt. Finally it is molded, cut, and packed.

There has been much opposition to butter substitutes, chiefly due to the fear that such products might be sold as real butter by unscrupulous dealers. However, oleomargarine is a valuable and wholesome food when made of pure fats and sold on its own merits. It does not have the delicate flavor of butter, and the growth-stimulating element found in butter (*see Butter*) is lacking or reduced in quantity, according to the amount of milk products used in its manufacture. However, oleomargarine has the advantage of keeping better than butter, for it does not turn rancid so readily. To prevent unfair competition with butter, a special tax is levied on oleomargarine which is highest on the product colored to imitate butter, and government inspectors regulate its manufacture and sale. Most producers of oleomargarine take advantage of the lower tax on the uncolored product and include coloring matter with the package so that the buyer may add it later.

There are a number of tests

for distinguishing between oleomargarine and pure butter. The boiling test is a simple one which can be applied in any household. Heat a small sample in a tablespoon held over a low flame, and stir with a splinter of wood until it boils briskly. Thereafter genuine butter will foam and boil with very little noise, while either renovated butter or oleomargarine will boil noisily and sputter as does a mixture of hot grease and water.

OLIVE. The olive is the Methuselah among cultivated trees, for in ancient olive groves there are found giants 20 feet around and 700 to 1,000 years old. The tree does not come into full bearing until it is 30 years old—an age at which most orchard trees are past their useful life—and it exhibits wonderful vitality by continuing to bear throughout its long life.

The cultivation of the olive began in prehistoric times, and its products, chief of which is the oil pressed from its fruit, were of great importance to the ancient world. The strength and fruitfulness of the olive tree were proverbial, and the olive branch was a symbol of peace and plenty. In Greece it was sacred to Athena, and a crown of olive leaves was the reward given victors in the Olympic games. Before the discovery of soap, anointing the body with olive oil was extensively practiced by wealthy Greeks and Romans.

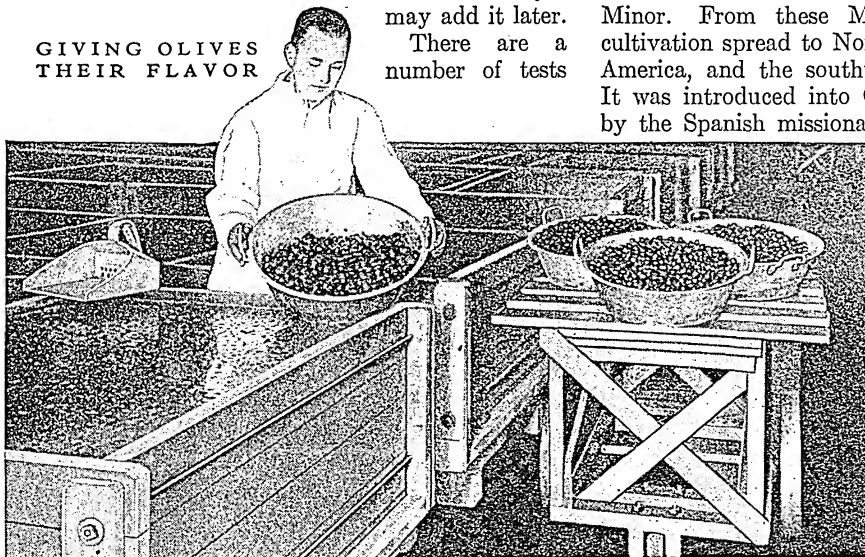
The olive tree is one of the fruits mentioned in the Bible, and Palestine still has its famous Mount of Olives. One peculiarity of the olive is that it thrives particularly in soil composed chiefly of volcanic ash. After each destructive eruption of Vesuvius and Etna, the olive groves at the base and even on the sides of the volcanoes have been replanted.

The olive is a native of southern Europe and Asia Minor. From these Mediterranean countries its cultivation spread to North Africa, Australia, South America, and the southwest of the United States. It was introduced into California at an early date by the Spanish missionaries. California is the chief

olive-growing state, but parts of Arizona and New Mexico are also suited to its cultivation.

Today as in ancient times the products of the olive are of great value for food and other purposes. In the Mediterranean countries olive oil is used as we use butter and other fats for cooking, and it is highly prized everywhere as a salad oil. The inferior grades are used for lighting and for soap making. Although the industry in California has developed

GIVING OLIVES THEIR FLAVOR



When first picked, all olives have a bitter, unpleasant flavor. This is removed by soaking them in clear water in large vats. Sometimes, if it is desired to hasten the process, a solution of potash-lye is used, but olives treated in this way must later be soaked in clear water, which must be frequently changed. They are then placed in brine, first a weak solution, which is gradually strengthened until the desired flavor is obtained.

rapidly, the United States imports millions of gallons of olive oil and a great quantity of pickled olives, chiefly from Greece, Spain, and Italy. Dried ripe olives are eaten in Greece, but in most other countries they are pickled, either ripe or green.

The olive contains as high as 60 to 70 per cent of oil, which gives it its food value. In olive-growing communities the people get oil for their own use by crushing the fruit in a press similar to the cider press. For the commercial production large mills are used. The rich yellow high-grade oils are drawn off first. Then water is poured over the compressed pulp and pressure is applied to remove the inferior grades of oil, which may be recognized by their greenish color.

When olives are picked from the tree they are extremely bitter. To remove the unpleasant flavor they are soaked in lye, and after rinsing are put into a brine solution. Chemical analysis shows little difference in composition between the green and ripe pickled olives.

The wood of the olive tree is very hard and possesses a beautiful grain and color, and it is used for ornamental cabinet work. The tree, which attains a height of 25 feet, is covered with a gray bark; its evergreen leaves are smooth, thick, and grayish-green above and white underneath. Scientific name of the cultivated olive tree, *Olea europaea*.

OLYMPIC GAMES. For more than a thousand years the Olympic Games of the Greeks were held in July of every fourth year in honor of Zeus, the highest of the gods. A traditional list of the victors constructed in later times went back to the games of 776 B.C., and this date was later taken as a con-

venient basis from which to reckon time, using as units the "olympiad," or four-year period between the celebrations. The games were held in one of the fairest spots in all Greece—the well-wooded valley of Olympia in Elis, through which, in sight of snow-crowned peaks, flows the famous river Alpheus. To adorn this natural sanctuary the greatest artists of the land wrought statues and built temples in a sacred grove dedicated to the Olympian Zeus. Most magnificent of all the shrines was that of the father of gods himself, in which stood a colossal statue of Zeus wrought of ivory and gold by the great sculptor Phidias, and reckoned as one of the Seven Wonders of the World.

Across the sacred grove, after due sacrifice had been made to the gods, the athletes marched to the stadium, where the contests took place. At first the only event was a 200-yard dash. Later this was supplemented by the *pentathlon*, a five-fold match consisting of running, wrestling, leaping, throwing the discus, and hurling the javelin. Other trials of strength, skill, and endurance were later added, including boxing and a chariot race.

The prizes given the victors were simple olive wreaths from the sacred olive-tree which grew behind the temple of Zeus—planted, according to tradition, by Heracles (Hercules), the founder of the games. Thus crowned, the winners marched in glad procession around the sacred grove, while their admirers chanted to the accompaniment of the flute triumphal songs written for the occasion by some great poet. When the victors returned to their native cities they were received with extraordinary honors. Statues

ALL HAIL TO THE WINNER!



In this painting the artist has pictured the finish of the foot race, the last event of the Olympic Games, when these were at their height. When this last race was over, the great crowd, which had already worked itself up to a high pitch of enthusiasm, jumped to its feet and cheered wildly, the trumpeters blew great blasts on their instruments, and the air was filled with waving olive branches. For this event the distance was usually twice the full length of the stadium.

were erected to them, they occupied the places of honor on public occasions, often they were exempted from taxes, and in some cities they lived thenceforth at the public expense.

These contests also had a religious significance, for the Greeks believed that the body of man has a glory as well as his spirit, and that men could best honor Zeus by developing mind and body in harmony. The Olympic Games exerted a profound and ennobling influence on the life of the Greeks. A sacred truce was proclaimed before the opening of the festival, and if any of the cities were at war, fighting ceased during the celebration. Men from all parts of the Greek world came together on these occasions, and thus friendship and unity were fostered. The Roman emperor Theodosius abolished the games in 394 A.D. (For the modern Olympic Games see Athletics.)

OMAHA, NEB. The "Gate City of the West," as Nebraska's metropolis has been called, stands on a height overlooking the Missouri River and commands the entrance to a vast inland empire stretching 1,500 miles westward. Here begins the great overland route first used by the Indians, and then by the

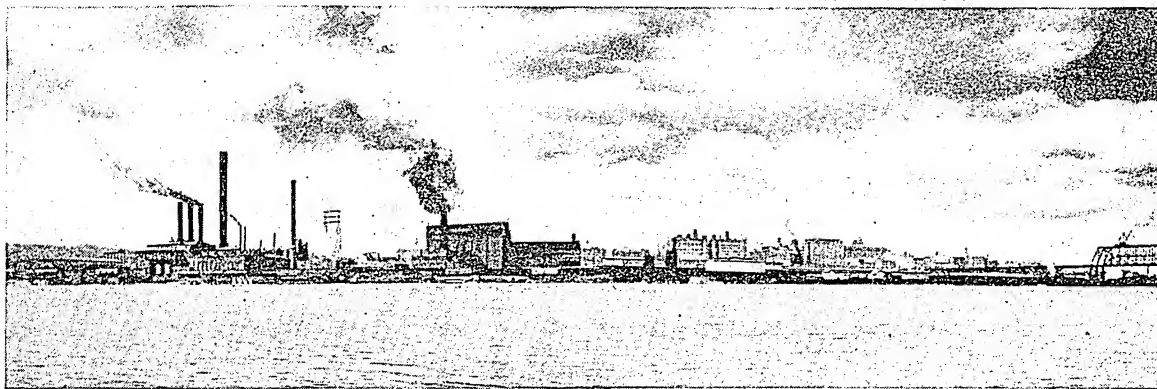
stockyards and packing plants, creameries, grain market and mills, bakeries, cereal factories, breweries, and sugar refineries. Other ranking industries include lead refining, iron and steel fabricating, railroad and machine shops, and airplane manufacturing.

Educational and cultural development has kept pace with business and industrial growth. The University of Omaha, Creighton University, Duchesne College, and the University of Nebraska College of Medicine are here. Beautiful Joslyn Memorial Art Institute houses permanent art collections, guest exhibits, an art library, and a concert hall. Green parks, providing beauty and recreation, are connected by miles of boulevards. A high proportion of the citizens own their homes.

Omaha is headquarters of the Army's Seventh Corps Area. Fort Omaha lies within the city limits, and Fort Crook is near by. One of the first large cities to adopt the commission form of government, Omaha owns its gas, water, and ice works. Douglas County adopted a county-manager plan in 1937. Population (1940 census), 223,844.

ONION. From the fragrant Easter lily to the humble onion with its pungent odor may seem a far cry; but the gap is not so great as it seems, for both belong to the large lily family. The characteristic odor and flavor of the onion come from a sulphurous oil which is driven off by boiling.

WHAT A CHANGE SINCE FRONTIER DAYS!



Omaha is built on the west bank of the broad Missouri River. A power plant appears at the left, and part of the business section at the right. The bridge at the right connects Omaha with Council Bluffs, Iowa. The Missouri has been deepened by the Federal government so that Omaha has a navigable water route to the Mississippi and thence to the gulf.

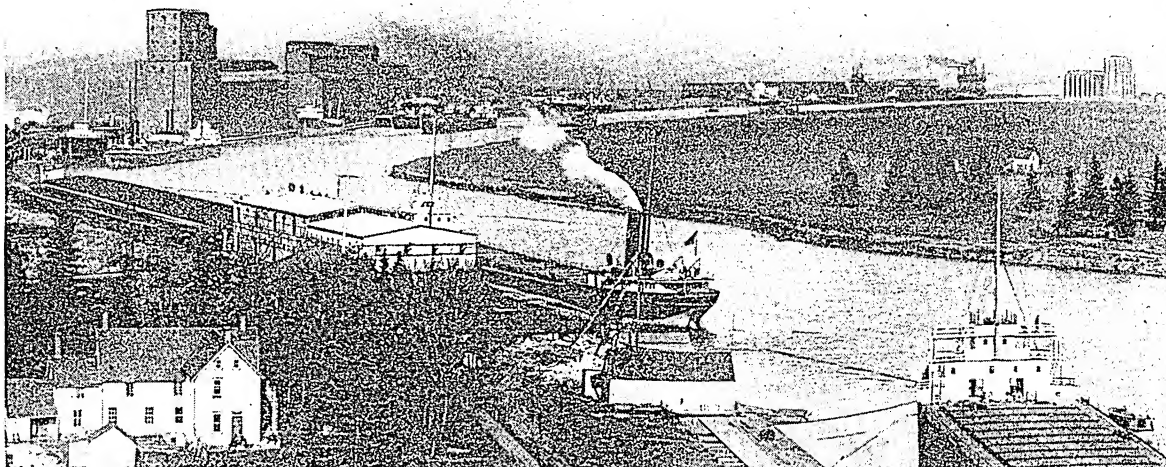
explorers and fur traders who blazed the trail for the onrush of settlers. Mormon immigrants had a winter camp here. Gold-seeking "forty-niners" and wagon trains of home seekers bought supplies at this outpost, booming the town's business as "provisioner of the West," on which a large share of its wealth is based. River passengers and freight transferred here to trail, and later to rail, when the Union Pacific, first trans-continental railroad, pushed westward from Omaha. Other railroads followed, and today it is a dominant transportation center—the hub of many rail, air, truck, and bus lines. The frontier trading post became the territorial capital in 1854, after a treaty with the Omaha Indians had opened Nebraska Territory to settlement.

The vast, rich agricultural and stock-raising regions tapped by its transport network furnish the materials for its chief commercial and industrial activities;

The mildest and biggest of the onions are those of the white Spanish variety, which often weigh a pound or more. They grow in California and the Southern states and in the Mediterranean countries. The Bermuda onion, which is also grown in the United States, is nearly as large and sweet as the Spanish. The potato onion is a form that has several small irregular bulbs instead of a single bulb.

Onions have been grown for their edible bulbous roots from time immemorial. Their original home is supposed to have been in central Asia. They belong to the same genus, *Allium*, as the milder leek, and the more pungent garlic, both of which are extensively cultivated in Europe. Chives are smaller members of the same genus; they are grown as an ornamental border for gardens and also for their leaves, which are used for seasoning. Shallots have a flavor somewhat milder than garlic.

The INDUSTRIAL HEART of the CANADIAN DOMINION



ONTARIO, CANADA.

The province of Ontario may be regarded as the center of Canada geographically and politically. Lying between the provinces of Quebec and Manitoba, it connects the older part of Canada with the great new prairie regions of the West; and the political life of Canada centers in Ottawa, one of the province's chief cities and the capital of the Dominion.

In wealth and population Ontario stands first among the provinces, and in area, it is second, with more than 412,000 square miles. In it live nearly one-third of the Canadian people. But if the entire population of Canada were scattered evenly over the province the people would not be crowded, for Ontario is almost as large as France and Germany together. The distance from the extreme eastern part to the extreme western part is 1,000 miles—about as far as from New Jersey to Kansas—and from north to south the province stretches 1,075 miles.

The Garden of Canada

Ninety per cent of the people live in the southern part on the tongue of land between Lake Huron and Lakes Erie and Ontario. Here the climate is delightfully mild, tempered by the Great Lakes. This is the garden of Canada, where grapes, pears, peaches, plums, apples, and vegetables are grown. The farmers here also grow hay, oats, wheat, barley, corn, tobacco, and flax. Because they have found it more profitable to feed their hay and grain to animals than to sell these products, the region has become famous for its dairy and meat products. This district makes three-fourths of all the cheese produced in Canada. Most of it is exported to the United Kingdom.

Extent.—Greatest length east to west, about 1,000 miles; north to south, 1,075 miles. Area, 412,582 square miles, including 49,300 square miles of water surface. Population, 3,431,683.

Natural Features.—Great Lakes (Superior, Huron, Erie, Ontario) and St. Lawrence on the southern boundary; James Bay (an arm of Hudson Bay) on the north. Lakes: Nipissing, Nipigon, Lake of the Woods, and numerous lesser lakes. Principal rivers: Ottawa (tributary to the St. Lawrence), Albany, Moose, Attawapiskat, and Severn (flowing into Hudson Bay).

Products.—Hay, oats, wheat, corn, flax, tobacco, apples, grapes, and vegetables; cattle, sheep, hogs, and horses; furs; dairy products; nickel, silver, copper, gold, radium, platinum, petroleum, and natural gas; lumber and timber products, flour and feed; automobiles, meat, pulp and paper, rubber goods, electrical apparatus, bakery products, textiles, machinery, iron and steel products.

Cities.—Toronto (capital, 631,207), Hamilton (155,547), Ottawa (126,872), Windsor (98,179), London (71,148), Kitchener, Brantford, Fort William, St. Catharines, Kingston, Oshawa, Sault Sainte Marie, Peterborough, Guelph, Port Arthur, Niagara Falls.

The region is abundantly supplied with water power, chiefly from Niagara Falls, the rapids of the St. Lawrence, and the falls of the Ottawa River and its tributaries. This cheap power, the abundance of raw materials, and Ontario's ample transportation facilities by rail and water

have made it the chief manufacturing province of Canada, producing one-half of the total industrial output in value. Heavy bulk freight is carried at low cost on the rivers, lakes, and canals (*see* Canals).

Towns and cities are concentrated in the southern part. Toronto (capital of the province), Hamilton, Ottawa (capital of the Dominion), Windsor, and London are the largest cities. Toronto is the seat of the University of Toronto. In Kingston are Queen's University and the Royal Military College. McMaster University is in Hamilton. Fine paved roads connect all these cities and attract many tourists from the United States. The 73-mile Queen Elizabeth Way between Toronto and Niagara Falls, opened in 1940, is an express highway of the most modern design.

North of the Great Lakes, towns and cities are few. Until recently people thought that this land was useful only to the fur trader and the lumberman. Since the discovery that the hardy grains can be raised there, the district is being settled by farmers.

Abundant Mineral Resources

But a more valuable source of wealth in this northern region has been found in the rich and varied mineral deposits, from which comes one-half of all Canada's mineral production. In the Sudbury district north of Lake Huron nine-tenths of the nickel supply of the world is mined. From the Cobalt

region come millions of dollars' worth of silver and cobalt every year. Rich gold mines supply a considerable share of the world's production. Copper, platinum, petroleum, and natural gas are other important mineral products. Deposits of iron, lignite, and radium ores await development.

North of the "Height of Land," which divides the water systems of Hudson Bay and the St. Lawrence, towns are few, and great forests stretch to the northern limits of tree growth. These forests cover more than one-half of the surface of the province and are the source of two of its chief industries. Here in winter is cut the spruce from which paper pulp is made, and pine is cut for lumber. Fur-bearing animals still find shelter here, but fur farming is now far more important than trapping.

Beautiful lakes and rushing streams make the southern watershed a favorite region with campers and sportsmen. Georgian Bay and the Thousand Islands of the St. Lawrence River are popular vacation resorts. A number of the islands in both regions are now national parks. On Lake Erie is Point Pelee National Park. Algonquin Provincial Park, northeast of Georgian Bay, has in its 2,740 square miles nearly 3,000 lakes, and virgin forest harboring deer, moose, bear, and other wild animals. It is a game sanctuary. Quetico Provincial Park, in the Rainy Lake district northwest of Lake Superior, is also a game sanctuary, covering 1,500 square miles.

Landmarks in Ontario History

Ontario claims the oldest evidence of European exploration in the Western Hemisphere. Near the town of Beardmore, near Lake Nipigon, were discovered in 1931 a sword, a battle-ax, a shield handle, and pieces of rusty armor. Archeologists believe these to be Viking weapons of the late 10th century. A band of Northmen had apparently come down Hudson Bay and started inland to Lake Superior, some 500 years before Columbus' voyages. On the journey, one of the band lost his life and was buried with his weapons.

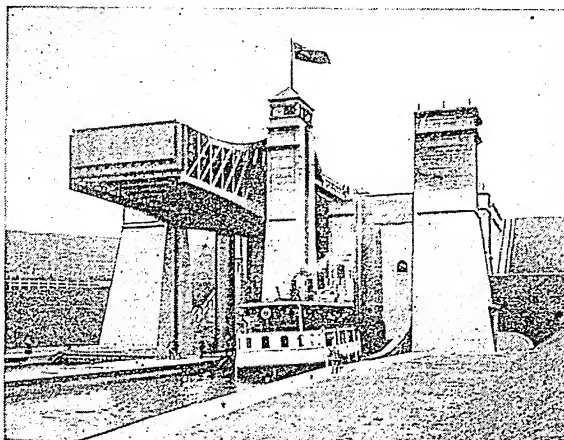
DUMPING SLAG AT A NICKEL SMELTER



This is one of the Ontario smelters which supply all but a small part of the world's nickel. The red-hot molten waste left when the ore is smelted is being dumped on the slag heap.

Until 1783 the fur trader and the Indian had almost sole possession of the region now included in Ontario. But at the time of the American Revolution many British loyalists who suffered persecution as "Tories"

AN "ELEVATOR" FOR SHIPS



The hydraulic lift lock in the Trent Canal at Peterborough is one of the few existing locks of its kind. Between these concrete towers two great tanks move up and down 65 feet on plungers, like hydraulic elevators. The vessel in the picture is entering the lower tank. When the gates of this tank have been closed, enough water will be admitted to the upper tank to overbalance the lower tank, forcing it to rise with the ship.

in the United States settled in Ontario because they wished to live under the British flag. These were the real founders of the province. In 1791 the territory was organized as the province of Upper Canada. In 1837 occurred the rebellion headed by William Lyon Mackenzie. Although promptly quelled, it hastened the redress of the political evils which had provoked it (see Mackenzie, William Lyon). In 1841 Ontario was reunited with Lower Canada, or Quebec, and in 1867 it became a part of the newly formed Dominion of Canada as a separate province. Population, about 3,430,000. (See also Laurentian Plateau.)

ONTARIO, LAKE. The smallest and easternmost of the Great Lakes was discovered by Samuel de Champlain in 1615. It was the first to carry the commerce of the New World. The first steamboat on the Great Lakes, the *Frontenac*, was launched near Kingston, Ontario, in 1816, and the following year the *Ontario* was launched on the American side. The lake is 193 miles long and 53 miles wide, with an area of 7,540 square miles. Its surface lies 246 feet above sea level, and its greatest depth is 774 feet.

It is fed principally by the Niagara River, through which the waters of Lake Erie rush in a terrific tumble of 326 feet in 36 miles. Since 1829 vessels from Lake Erie have been able to go around Niagara Falls and into Lake Ontario through the Welland Ship Canal. The lake is connected with the Hudson River by the New York State Barge Canal, with Georgian Bay by the Trent Canal, and with the Ottawa River by the Rideau Canal. The principal ports are Toronto, Hamilton, and Kingston, in Ontario; and Oswego, in New York. (See Canals; Great Lakes; Welland Ship Canal.)

OPERA. Like many beautiful things in our modern world, grand opera had its beginnings in ancient Greece. The great tragedians combined music, poetry, and dance to tell their dramatic tale; the actors would recite their dialogue with special intonations, while with their voices moved the music of lyre or flute, in harmony with the theme of the drama. This was not precisely grand opera, but from it came opera, centuries later. (See Drama; Greece; Greek Language and Literature.)

The old Greek entertainment was forgotten during the Middle Ages, but then came the Renaissance, and Europe turned back to the splendid, lost, pagan world (see Renaissance). A group of cultivated men in Florence, called the *Camerata*, revived some of the old Greek plays, with musical accompaniment, at the aristocratic house of Bardi in 1584. Music, finding new wings in these stirring days, suggested fresh harmonies for this new-old entertainment, and poets supplied new plays. In 1600 the first opera was given in public, Jacopo Peri's musical setting of the poet Ottavio Rinuccini's 'Eurydice'.

It is sometimes erroneously stated that the first opera was 'Le Jeu de Robin et de Mario', by Adam de la Halle, produced in Naples in 1285. This production, however, was nothing more than a pastoral in dramatic form, with the dialogue broken by extraneous ballads. The music had no connection with the drama, nor was any part of the drama enhanced, interpreted, or accompanied by music. Opera did not begin with this pastoral, but with the efforts of the *Camerata*.

Monteverde's Bold Step

Claudio Monteverde, one of the pioneering spirits of the period, at once recognized the possibilities of the *Camerata's* new plaything, and made a living work of art out of their previous wooden imitations of the Greeks. His pupil, Pietro Francesco Caletti-Bruni, better known as Cavalli, permitted the actors to halt the action and sing a song, the first operatic aria. In so doing he nearly destroyed opera, for his successors allowed the aria to "run away with the show." Even Alessandro Scarlatti, who founded the Neapolitan school in the late 17th century, was unable to give drama its proper dominance in opera. He did produce the first operas in which all the words were sung, with no recitative.

All forms of Italian art were rapidly spreading to other countries. Opera entered France with the red cloak of Cardinal Mazarin, who brought in his wake a kitchen scullion, Giovanni Battista Lulli, who became known as Jean Baptiste Lully. By a rapid rise he became head of the Royal Academy of Music,

fostered the ballet in opera, and originated the overture. France was always inclined to emphasize the ballet and the pageantry of opera, Italy the music and the aria, Germany the drama.

The downfall of the ranting and oppressive aria came only with the German, Christoph Willibald Gluck, in the 18th century. Disgusted with the Italian operas, in which composers showed off their learning and singers their voices, he stirred up a tempest by writing operas in which choruses and solos were not allowed to bring the drama up short, at an awkward moment.

At about the same time the humorous Neapolitans, who had never taken the heroics of opera too seriously, introduced between acts lively musical farces, often parodies of grand opera, which they called *opera buffa* (funny opera). Opera buffa became the ancestor of both *opéra comique* and *opéra bouffe* in France. *Opéra comique* was not comic at all, but differed from grand opera only in having some of its dialogue spoken, not sung. *Opéra bouffe* was farcical, irreverent, and light. The work of Jacques Offenbach crystallized the distinction between them. In Germany, opera buffa developed, in the hands of the genius Wolfgang Amadeus Mozart, into fine productions such as 'The

Marriage of Figaro' and 'The Magic Flute'. The German *opéra comique*, called a *singspiel*, includes Ludwig van Beethoven's 'Fidelio' and Carl Maria von Weber's 'Der Freischütz'.

Great as were the improvements made by Mozart in opera, they had no lasting effect. The Italians slipped back under the tuneful spell of the interfering aria, though Gioacchino Rossini in light opera and Gaetano Donizetti and Vincenzo Bellini in the more serious vein sought to raise the level of operatic standards. Giacomo Meyerbeer cleverly catered to the romantic taste of the times.

The next great upheaval came from Richard Wagner, who, true to German preferences, thundered with all his strength against the aria and the tinkling tune, wrote

his librettos on mighty themes, made the music fit the mood, and the drama dominate the entire production. To him we owe the *leit-motif*, a recurring brief air to symbolize the return to the scene of a certain mood or a certain character. When Lohengrin comes on the stage, we hear the Lohengrin theme running in the music; when tragedy draws near, the music broods. (See Wagner, Wilhelm Richard.)

Great Names in Opera

Wagner's influence was felt in all countries. He had refused to call his later operas by the old name, but termed them "music dramas." Since his time, grand

MME. SCHUMANN-HEINK



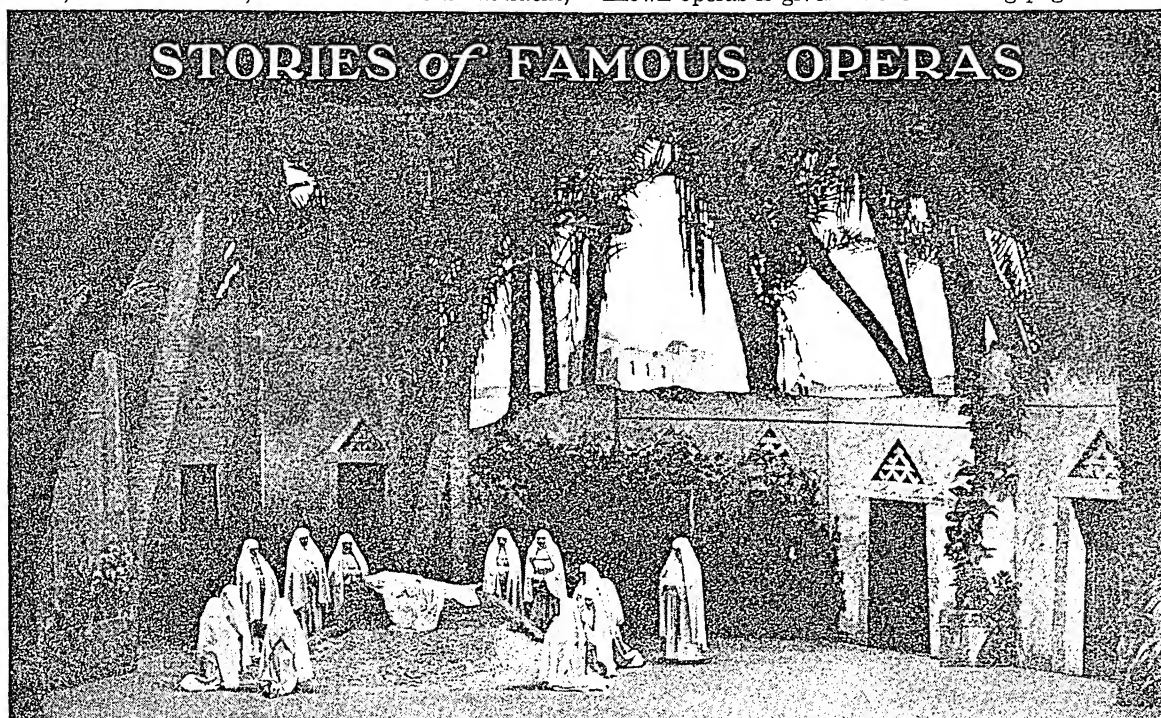
The great contralto as Erda, the earth goddess, in Wagner's opera 'Siegfried'.

opera has been more sincerely a drama set to music, and less of a musical "grand uproar," as the impious have sometimes called it.

In so brief a space, it is possible only to mention a few of the outstanding names on the long roster of famous composers of opera. These include, in France, Léo Delibes, Charles François Gounod, Georges Bizet, Jules Massenet, Charles Camille Saint-Saëns,

and Claude Debussy; in Italy, Giuseppe Verdi, Arrigo Boito, Pietro Mascagni, Ruggiero Leoncavallo, Giacomo Puccini, Ermanno Wolf-Ferrari, and Italo Montemezzi; in Russia, Michael Ivanovich Glinka, Modest Moussorgsky, Nicholas Rimsky-Korsakof, and Peter Tschaikovsky.

A summary of the stories of a number of well-known operas is given in the following pages.



No one who has seen the last act of 'Thais' can ever forget its haunting beauty. As the repentant Thais lies dying in the convent garden, and the nuns chant their prayers, the lovely strains of the 'Meditation' are heard again, richer and more triumphant.

Aïda (ä-ë'dä). Rhadames, an Egyptian general (tenor) loves the captive princess Aïda (soprano). Through his love he unwittingly betrays his country and is sentenced to death. The Egyptian princess Amneris also loves Rhadames and offers to save his life if he will marry her. He refuses and is placed in a tomb, together with Aïda, and there the lovers die.

The work is majestic in conception, allowing of unbounded stage display. Best-known selections are: *Celeste Aïda* (Rhadames), *Ritorna vincitor* (Aïda), Act I, Scene I; the Grand March, Act II, Scene II; *O patria mia* (Aïda), Act III; *O terra addio* (Aïda and Rhadames), Act IV, Scene II.

Music by Verdi. Written 1869 at request of Khedive of Egypt; produced at Royal Opera House, Cairo (1871) to commemorate completion of Suez Canal. Italian. Four Acts.

L'Amore dei Tre Re (lä-mö'rä dä'ë trā rä) (The Love of Three Kings). Fiora (soprano) has been forced to marry Manfredo (barytone), son of the blind old King Archibaldo (bass). Secretly she meets Avito (tenor), her former fiancé. Archibaldo suspects her and when she admits her guilt, he strangles her. As she lies on her bier, Avito kisses her and dies of the poison Archibaldo has placed there to trap him. Manfredo kisses the lips also and dies.

Music by Italo Montemezzi; text by Benelli. Produced Milan, 1913. Italian. Three Acts.

The Barber of Seville. The libretto is based upon the first of a trilogy of 'Figaro' comedies by Beaumarchais. Plot concerns the efforts of Count Almaviva (tenor) to win the beautiful and wealthy Rosina (soprano). Her guardian, Bartolo (bass), watches her carefully, trying to keep her and

her money for himself. Through the aid of the barber, Figaro (barytone), the Count wins the girl, making great sport of Basilio (bass), a music master and marriage agent.

Music by Rossini allows excellent chance for display of vocal skill, especially the well-known *Largo al factotum* (Figaro), *Una Voce poco fa* (Rosina), and *La Calunnia* (Basilio), Act I. Produced Rome, 1816. Italian. Two Acts.

La Bohème (lä bö-ëm'). In an attic of the Paris Latin Quarter, four friends are living gaily but precariously. Rudolph, a poet (tenor) is in love with Mimi, a frail little embroiderer (soprano), and Marcel, a painter (barytone) with Musetta (soprano). The lovers quarrel and part, but are reunited in the last act when Mimi, dying of consumption, is brought back to Rudolph. Well-known selections are: *Racconto di Rodolfo* (Rudolph), *Mi chiamano Mimi* (Mimi), Act I; 'Musetta's Waltz,' Act II; *Addio* (Mimi), followed by quartet *Addio, dolce svegliare* (Mimi, Rudolph, Musetta, Marcel), Act III; *Ah, Mimi, tu più* (Rudolph and Marcel), Act IV.

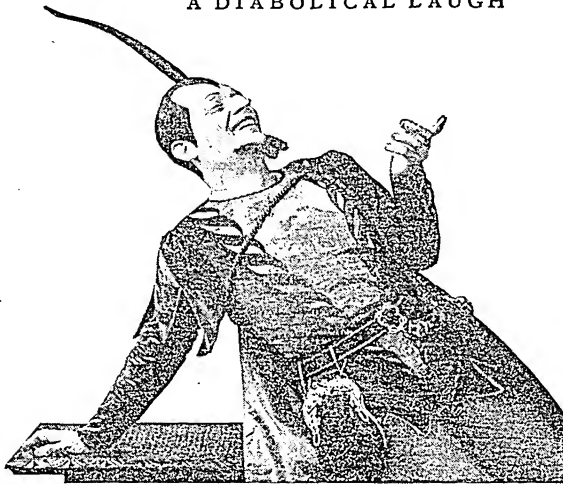
Music by Puccini; text founded on Mürger's book 'La Vie de Bohème'. Produced Turin, 1896. Italian. Four Acts.

Car'men. The fiery Spanish gipsy, Carmen (soprano) is arrested for stabbing one of her companions, but she so fascinates Don José (tenor) that he allows her to escape. He deserts his old sweetheart Micaela (soprano), and follows Carmen, but when Carmen transfers her love to Escamillo (barytone), a bull-fighter, Don José, madly jealous, kills her.

The original spirited music is highly esteemed by both musicians and public. Most celebrated in rôle of Carmen was

Emma Calvé. Well-known selections are: The 'Prelude', *Habanera* (Carmen), Act I; the 'Toreador Song' (Escamillo), the 'Flower Song' (Don José), Act II; the 'Card Song' (Carmen), *Je dis que rien ne m'épouvante* (Micaela), Act III.

A DIABOLICAL LAUGH



Virgilio Lazzari singing the rôle of the suave, demoniacal tempter Méphistophélès in Gounod's popular opera 'Faust'.

Music by Bizet. Text based on story of Prosper Mérimée. Produced Paris, 1875. French. Four Acts.

Cavalleria Rusticana (*kä-väl-lä-ré-ä rus'të-kü-nä*) (Rustic chivalry). Action takes place in square outside a church in a Sicilian town on a glorious Easter morning. Turiddu (tenor), a soldier, has just returned from war to find his sweetheart Lola (mezzo soprano) married to Alfio (barytone). Turiddu then takes Santuzza (soprano), a village maiden, as his beloved but the jealous Lola wins him back. This leads to a duel with Alfio in which Turiddu is killed.

Music by Mascagni. Libretto based upon story of Giovanni Verga. Best-known numbers are the 'Prelude', including the simple love song *Siciliana* sung off-stage by Turiddu, and the 'Intermezzo'. First production Rome, 1890. Italian. One Act.

Faust. Weary of life, Faust (tenor), an aged philosopher, is offered youth and power by Méphistophélès (bass) in exchange for his soul. Shown a vision of the lovely Marguerite (soprano), Faust signs the compact. He wins Marguerite's love but betrays her. She finally dies in prison, her soul ascending to heaven, and Faust is carried off to the underworld.

Work abounds with lovely melodies popular the world over. Among them are 'Even Bravest Heart' sung by Valentine, Marguerite's brother, and 'The Calf of Gold' (Méphistophélès), Act II; the whole garden scene, Act III, including Siebel's 'Flower Song', Faust's 'All Hail Thy Dwelling', Marguerite's 'The King of Thule' and 'Jewel Song', and Faust's 'Let Me Gaze'; the 'Soldiers' Chorus', Act IV, and the prison scene, Act V; and all the ballet music.

Music by Gounod. Libretto based upon Goethe's poem 'Faust'. First production Paris, 1859. French. Five Acts.

The Huguenots. Scene is France, 1572. To pacify Catholic and Protestant parties, a marriage is planned between Valentina (soprano), a Catholic, and Raoul de Nangis (tenor), a Protestant. Mistakenly suspecting Valentina's honor, Raoul publicly denounces her, which leads to open fray ending in Massacre of St. Bartholomew. Too late, Raoul

learns his mistake about Valentina and a love scene ensues between them just before he leaps to his death in the massacre.

Raoul's *Romanza*, 'Fairer than the Lily' and *Piff! Paff!*, song of Raoul's servant, Marcel, Act I, are well known.

Music by Meyerbeer. Text by Scribe and Deschamps. A showy opera both dramatically and musically. Produced Paris, 1836. French. Five Acts.

Jewels of the Madonna. The scene is Naples. Maliella (soprano) is in love with Rafaele (barytone) who boasts his love is so great he would even steal the jewels that deck the Virgin's statue for her. She taunts her other admirer, Gennaro (tenor) with the boast and he steals the gems. Finally, in terror, Maliella drowns herself; Gennaro returns the gems and stabs himself.

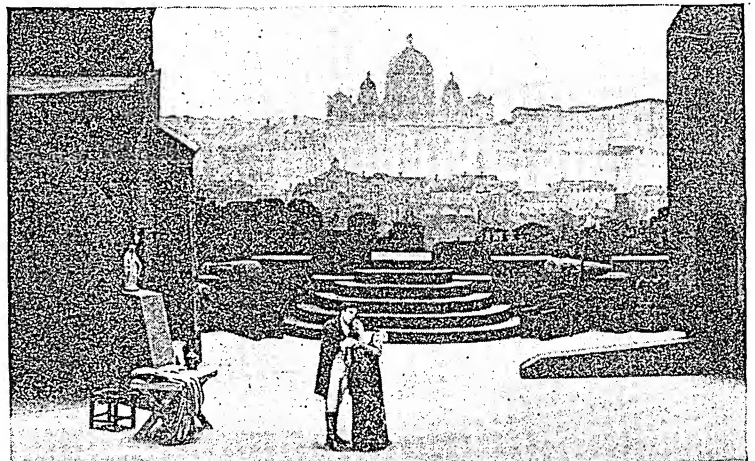
Music by Wolf-Ferrari. Produced Berlin, 1911. Italian. Three Acts.

Le Jongleur de Notre Dame (*le zhôn-glûr' de nôl'r dâm*). Jean, a street juggler enters a monastery. His friend, Boniface (bass), the cook, convinces him that any work well done is good in the sight of God. Jean shuts himself in the chapel and performs his tricks before the Virgin's statue. When the outraged monks rush in they notice the statue come to life, blessing Jean who dies at the altar. 'The Legend of the Sagebrush' (Boniface), Act II, is well known.

Massenet wrote the score for all male voices, but the rôle of Jean was frequently sung by Mary Garden. Libretto by M. Lena, from a medieval miracle play. Produced Monte Carlo, 1902. French. Three Acts.

La Juive (*là zhü-év'*) (The Jewess). The story is concerned with the hatred existing between Jews and Gentiles in the early 15th century. Disguised as a Jew the Prince of the Empire, Leopold (tenor), has been making love to Rachel (soprano), daughter of the old Jewish goldsmith Eléazar (tenor). The penalty for such love is death to both. When Leopold's betrothal is announced to the Princess Eudoxia (soprano), the jealous Rachel publicly exposes him as her lover. Later she repents and declares him innocent. He is released, but Eléazar and Rachel are condemned by the Cardinal (bass) to die in boiling oil or accept Christianity.

THE FINAL ACT OF 'LA TOSCA'



The scene is a balcony of the prison Castle Sant' Angelo, Rome, at dawn. In the background the Vatican and dome of St. Peter's are visible. Here Tosca and Mario sing their ironic last song of happiness.

Both refuse. Just as Rachel is plunged to her death Eléazar reveals her as the lost daughter of the Cardinal.

Music by Halévy. Text by Scribe. Produced Paris, 1835. French. Five Acts.

Lohengrin (*lô'en-grîn*). The young Duke Godfrey has disappeared and his sister Elsa (soprano) has been accused of his murder. When her champion is called for, a handsome knight (tenor) in a swan-driven boat appears. He makes one

important demand of Elsa. She must never ask his name or rank. On her wedding day, driven wild with curiosity by Ortrud (contralto), Elsa asks the fateful question. Before everyone the knight tells he is Lohengrin but departs immediately in his swan-driven boat. In glee, Ortrud shrieks that the swan is Godfrey whom she herself has bewitched. Lohengrin then frees the swan and the young duke appears. Lohengrin is lost to view and Elsa sinks lifeless to the ground.

Most popular selections are: 'Elsa's Dream' and Lohengrin's 'My Faithful Swan' in Act I; the 'Wedding March' and Lohengrin's 'Narrative', Act III.

Music and text by Wagner. Produced Weimar, 1850. German. Three Acts. Last work Wagner called by title of "opera."

Louise. Torn between duty to her parents and the longing for a full life, Louise (soprano), a little sewing girl, leaves home to live with Julien (tenor), an artist. They are happy in their little abode in Montmartre, Paris, when Louise's mother comes, telling of her father's illness. Louise returns home for a brief time, but, scolded by her parents, goes back to Julien. *Depuis le jour* (Louise), Act III, is well known. Words and music by Charpentier. Produced Paris, 1900. French. Four Acts.

Lucia di Lammermoor. (*lŭ-chē'ä dē lä-mär-mōōr'*). For financial reasons Sir Henry Ashton (barytone) tries to marry his sister Lucia (soprano) to Sir Arthur Bucklaw (tenor). But Lucia and Sir Edgar of Ravenswood (tenor) are in love. Sir Henry forges a letter and proves Sir Edgar false. Lucia marries Sir Arthur, but at the wedding feast Edgar dramatically reappears. Then follows the well-known sextet *Chi mi frena*. Lucia goes mad, kills the bridegroom, and a little later dies herself. Edgar, learning of her death, sings the mournful *Tu che a Dio spiegasti l'ali* and kills himself.

A popular but musically thin opera, allowing of great vocal display; has been a favorite of most coloraturas.

Music by Donizetti. Libretto based upon Scott's novel 'The Bride of Lammermoor'. First production in Naples, 1835. Italian. Three Acts.

Madama Butterfly. To make his sojourn in Japan more amusing, Pinkerton (tenor), an American naval officer, "purchases" in Nipponese fashion, a Japanese wife, Madame Butterfly (Cho-Cho-San) (soprano). He sails away and is gone three years, not knowing how seriously Butterfly has taken his love and that she has borne him a son whom she calls "Trouble." When he returns with an American wife, Butterfly realizes the truth and stabs herself, giving up her baby to Pinkerton's wife.

Japanese folk-songs and American themes are richly interwoven in the music. No set arias, although the love duet of

Butterfly and Pinkerton *Viene la sera*, Act I, and in Act II Butterfly's *Un bel di* and *E questo?*, also the orchestral interlude, 'Waiting Music', are popular.

Music by Puccini. Text based upon book of John Luther Long and drama of David Belasco. Produced Milan, 1904. Italian. Three Acts (originally two).

Manon. On her way to a convent, the lovely young Manon (soprano) meets Des Grieux (tenor) at an inn. They are infatuated and elope to Paris. But tempted by the wealth of an old nobleman she leaves Des Grieux. Then learning Des Grieux has entered a monastery, she follows him and wins him back. In the end Manon is condemned as an abandoned woman. Des Grieux follows her as she is about to be deported and she dies in his arms.

Well known are Des Grieux' *Le Rêve*, Act II, and *Fuyez, douce image*, Act III.

Music by Massenet. Libretto based upon Abbé Prévost's novel 'Manon Lescaut'. Produced Paris, 1884. French. Four Acts.

Manon Lescaut (*mā-nōn lēs-kō'*). The story is practically the same as 'Manon' (see above), both operas being based upon Abbé Prévost's novel 'Manon Lescaut'.

Music by Puccini. Presented Turin, 1893. Italian. Four Acts.

The Marriage of Figaro (*fē'gār-ō*). A lively farce based upon the second of the 'Figaro' comedies by Beaumarchais. The marriage of Figaro (bass), barber of the Count Almaviva, and Susanna (soprano), maid of the Countess Almaviva, is delayed by a series of amusing events caused by the Count's jealousy of Cherubino (soprano),

his wife's page and admirer, also by the Count's own attentions to Susanna.

Music by Mozart, includes some of his most delightful melodies. Well known are the 'Overture', *Non so più* (Cherubino), Act I; *Voi che sapete* (Cherubino), Act II; and the letter duet of Act III. Produced Vienna, 1786. Usually sung in Italian. Four Acts.

Martha. For amusement, Lady Harriet (soprano) and her maid (contralto) hire themselves out as servants to two young farmers, Lionel (tenor) and Plunkett (bass).

Lady Harriet becomes Martha; her maid, Julia. At the farmhouse it soon appears they can neither work nor spin. They escape that night but not before Martha has fallen in love with Lionel, Julia with Plunkett. Before the last curtain they are all happily betrothed; a ring proves that Lionel is the son of the banished Earl of Derby.

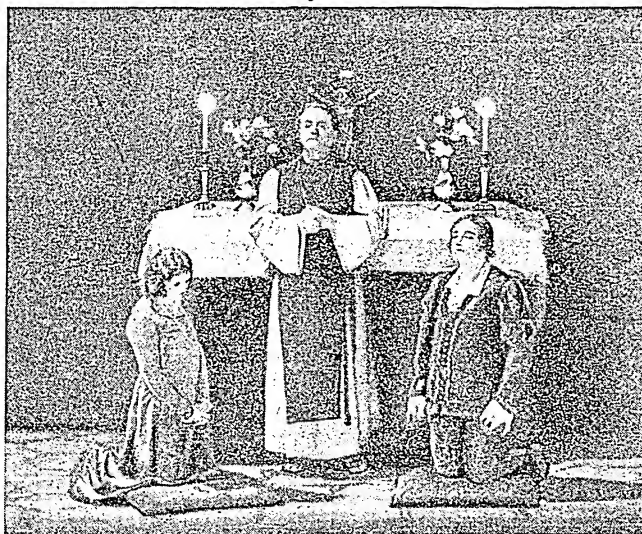
Of enormous popularity, the score is a succession of melodies familiar to almost everyone: 'The Last Rose of Summer' (an old Irish air) (Martha), the 'Spinning Quartet' and 'Good Night Quartet' (Martha, Julia, Plunkett, Lionel), Act II; *Canzone del porter* (Plunkett) and *M'appari* (Lionel), Act III.

MARY GARDEN



The alluring Flora in 'The Love of Three Kings', one of Miss Garden's most successful rôles.

ROMEO AND JULIET UNITED



In Friar Lawrence's cell the lovers are married. Here are Alice Mock as Juliet, Edouard Cotreuil as Friar Lawrence, and Charles Hackett as Romeo.

Music by Von Flotow. Produced Vienna, 1847. Usually sung in Italian. Four Acts.

Die Meistersinger von Nürnberg (*dē mis'tēr-zīng-er fon nūrn-berk*) (The Master Singers). Sir Walter von Stolzing (tenor) becomes enamored of Eva (soprano). He determines to win the Master Singers' song contest the following day in order to obtain her as a bride, although he knows nothing of the rules. Beckmesser, town clerk (bass), a pedantic stickler for rules and himself in love with Eva, opposes him. But Hans Sachs, a cobbler (bass) and a genuine musician, sees real inspiration in Walter's singing and favors him. At the contest Walter wins with his glorious *Preislied* ('Prize Song').

Text and music by Wagner (produced Munich, 1868) show him in his full genius as poet, humorist, and musician. The lovers and the cobbler are said to be symbols of art and life,

The 'Prologue' (Tonio), the *Ballatella* (Nedda), and Canio's lament, *Vesti la giubba*, Act I, also Canio's *No, Pagliaccio non son*, Act II, are well known.

Music and libretto by Leoncavallo. Produced Milan, 1892. Italian. Two Acts.

Pelléas et Mélisande. Music by Claude Debussy is entirely modern in manner, without set melody. Text is from Maurice Maeterlinck's play of the same name. Both text and music are weighted with mystic meaning.

Golaud (barytone) finds the mysterious Mélisande (soprano) in the wood and brings her back to the king's castle as his wife. There she and Pelléas (tenor), half-brother of Golaud, fall in love. Wildly jealous, Golaud slays Pelléas. Mélisande, maintaining the innocence of their love, dies in the palace. Produced Paris, 1902. French. Five Acts.

THREE GREAT ARTISTS IN RÔLES FOR WHICH THEY ARE FAMOUS



At the left is Mme. Nellie Melba as Marguerite in 'Faust', one of opera's celebrated portrayals. In the center is Jean de Reszke, usually ranked as the greatest of all Tristans, while at the right is Adelina Patti, famous for her portrayal of Juliet.

Beckmesser of rule-blinded critics. Music throughout is a masterpiece of melodic and harmonic richness. The 'Prelude' and 'Prize Song' are well known. German. Three Acts.

Mignon (*mēn-yōn'*). A little dancing girl, Mignon (mezzo soprano), is saved from her gipsy master by Wilhelm Meister (tenor), a traveling student. He allows her to follow him as his page. She is in love with him but he is enamored of Filina (soprano), an actress. Mignon is injured in a burning castle and is brought to Italy by Lothario (bass), an old minstrel, who in reality is an Italian nobleman who has lost his memory. In the last act, however, his memory is restored. He recognizes in Mignon his long-lost daughter, stolen as a child by gypsies. Wilhelm recognizes his true love for Mignon and all ends happily.

Well-known selections are the 'Overture'; *Connaistu le pays?* (Mignon); *Les Hirondelles* (Mignon and Lothario), Act I; the *Polonaise* (Filina), Act II; the *Berceuse* (Lothario), Act III.

Music by C. L. Ambroise Thomas; text based on Goethe's 'Wilhelm Meister'. Produced Paris, 1866. French. Three Acts.

Otello. Libretto is based upon Shakespeare's tragedy, of same name (see 'Othello'). Music by Verdi, shows departure from the earlier Verdi manner. Well-known selections are Iago's *Credo*, Act II, Desdemona's 'Willow Song' and *Ave Maria* and the 'Death of Otello', Act IV. Produced Milan, 1887. Italian. Four Acts.

I Pagliacci (*pāl-yūt'chē*) (The Players). Opens with a prologue sung by clown Tonio (barytone). Canio (tenor), leader of a troupe of strolling players, is furiously jealous of his beautiful wife, Nedda (soprano), who is planning to run off with Silvio (barytone), a villager. In their little play a similar tragedy of a jealous husband and erring wife is enacted. In the play Canio stabs his wife, forcing her to call upon her lover Silvio, who rushes upon the stage and is killed by Canio, who then surrenders, singing, "Applaud, friends, the comedy is ended."

Rigoletto (*rē-gō-lēt'tō*). The dissolute Duke of Mantua (tenor) has won the love of Gilda (soprano), daughter of the hunchback, Rigoletto (barytone). Rigoletto conspires to have the Duke killed, but Gilda sacrifices herself to save him, and Rigoletto is given the assassin's sack containing his own dying daughter.

An extremely popular opera despite its gruesome story. Best-known selections are *Quest' o quella* (Duke), Act I; Rigoletto's soliloquy, *Pari siamo*, and Gilda's *Caro nome*, Act II; *La donna è mobile* (Duke) and the famous quartet *Bella figlia dell' amore* (Gilda, Rigoletto, Duke, and Maddalena), Act IV (originally Act III).

Music by Verdi. Text founded upon Victor Hugo's drama 'Le roi s'amuse'. Produced Venice, 1851. Italian. Four Acts (originally three).

Der Ring des Nibelungen (The Ring of the Nibelungs), a vast musical work by Richard Wagner based on the old legends of the Nibelungs (see Nibelungs, Song of the). The whole work consists of 'Das Rheingold', an introduction to the dramas, 'Die Walküre', 'Siegfried', and 'Götterdämmerung'.

Das Rheingold (*däs rin'gölt*). The hideous dwarf, Alberich (barytone or bass) learns from the Rhine maidens that he who would renounce love forever might steal their treasure, the Rhine gold, and that a ring made from it would render the possessor master of the world. Alberich seizes the gold, has the ring made, also a magic helmet, *Tarnhelm*. Wotan (barytone), father of the gods, takes the gold ring and helmet from Alberich and gives it to two giants to repay them for building the new castle of the gods, Valhalla. Alberich puts a curse on the ring. The giants quarrel and one is slain. The gods proceed to Valhalla.

Produced Munich, 1869. German. Four Scenes. Die Walküre (*dē vāl-kü'rē*) (The Valkyries). The Valkyries are nine daughters of Wotan whose mission it is to ride forth each day on flying horses and bring to Valhalla the bravest

of the slain. Brünnhilde, their leader (soprano), is Wotan's favorite. However, in a fight between Wotan's earthly son Siegmund (tenor) and Hunding (bass), Brünnhilde protects Siegmund against orders. Wotan intervenes, causes Siegmund to be slain and then slays Hunding himself. Brünnhilde carries to safety Siegmund's sister-wife, Sieglinde (soprano), to whom she gives the fragments of Siegmund's sword. Brünnhilde is made a mortal woman for her disobedience, and is put to sleep surrounded by a wall of magic fire and destined to become the wife of the first man brave enough to break through the fire and so awaken her.

The final act ranks as one of the most sublime in all music with its well-known 'Ride of the Valkyries', 'Wotan's Farewell', and the 'Magic Fire Spell'.

First produced in Munich, 1870. German. Three Acts. Siegfried (*sēg'frēd*). His mother, Sieglinde, dying at his birth, Siegfried (tenor) is raised by the dwarf Mimi. He becomes a magnificent hero. From the fragments of his father's sword he forges a mighty weapon. With it he kills Fafner the giant who has made himself into a fierce dragon to protect the magic ring and Rhine gold. He also kills Mimi. Licking a drop of the dragon's blood he is suddenly able to understand the birds, and one leads him to Brünnhilde (mezzo soprano) whom he awakens and loves. In the meantime, he has met Wotan and fearlessly broken Wotan's spear. The rule of the gods is about over.

Produced Bayreuth, 1876. German. Three Acts.

Götterdämmerung (*gū-tēr-dēm'mēr-ung*) (The Dusk of the Gods). Siegfried gives his magic ring to Brünnhilde, lovingly bids her farewell, and goes into the world. There Hagen, son of the dwarf Alberich, gives him a magic drink, which causes him to forget Brünnhilde and fall in love with Gutrune, sister of King Gunther. He agrees to bring Brünnhilde to the king for wife. Another drink causes him to remember, just before he is killed by Hagen. Brünnhilde learns of the drinks and forgives Siegfried. She has a huge pyre built for his body and, with the ring on her finger, rides into the flames. The Rhine overflows and the Rhine maidens seize the ring triumphantly. Valhalla is shown in flames. The world of the gods has passed and through the sacrifice of Brünnhilde, the finer era of love begins.

Contains some of Wagner's mightiest music, notably Siegfried's 'Journey to the Rhine', his 'Funeral March' and Brünnhilde's 'Immolation'. Presented Bayreuth, 1876. German. Three Acts.

Romeo and Juliet. The libretto is based upon Shakespeare's drama of the same name (see Romeo and Juliet). Juliet's gay 'Waltz Song', Act I, is best-known aria. Music by Gounod. Produced Paris, 1867. Five Acts.

Der Rosenkavalier (*dēr rōz'ēn-kā'vā lēr*). The story, depicting the loose morals typical of 18th-century Vienna, concerns the successful efforts of the young Count Octavian (mezzo soprano) to win Sophie (soprano), daughter of the newly rich Faninal (barytone). He exposes the vulgar old Baron Ochs of Lerchenan (bass) to whom Faninal was trying to marry Sophie.

Libretto by Hugo von Hofmannsthal. Music by Richard Strauss is rich in orchestration and waltz melodies. Produced Dresden, 1911. German. Three Acts.

Samson and Delilah. Samson (tenor), Hebrew leader of gigantic strength, is ensnared by Delilah (mezzo soprano). She delivers him into the hands of the Philistines. In Act III he appears shorn, blinded, and chained, treading a mill, praying God for mercy in *Vois*

ma misère, hélas. He is led in shame before the feasting Philistines, but praying for strength, seizes the marble pillars and overthrows the whole temple.

Best-known selections are Delilah's *Printemps qui commence*, Act I; *Mon cœur s'ouvre à ta voix* (Delilah), Act II; and the 'Bacchanale', Act III.

Music by Saint-Saëns. First produced in Weimar, Germany, 1877. French. Three Acts.

Tales of Hoffmann. Opens with a prologue, the poet Hoffmann agreeing to tell a group of tavern companions of his three great loves. Story of loves forms the next three acts. All are frustrated by an evil genius that follows him. The first girl is an automaton, the second a mocking coquette, the third a dying consumptive. In the epilogue he is left alone, only the poetic Muse remaining faithful.

The 'Barcarolle', Act III, is extremely popular. Music by Offenbach. Produced Paris, 1881. French. Three Acts.

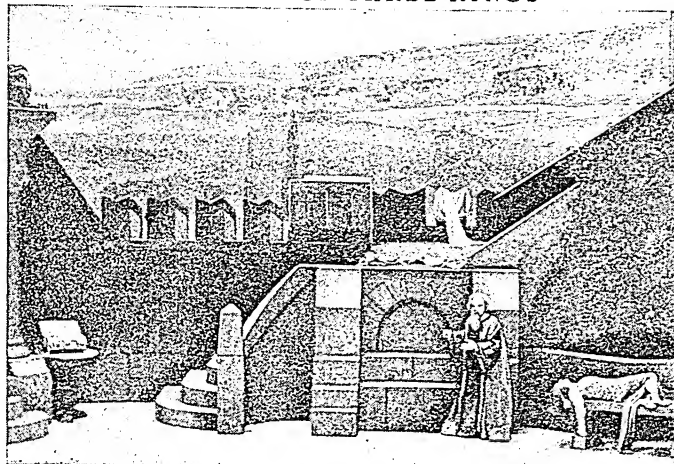
Tannhäuser (*tän'hoi-zēr*). The minstrel knight, Tannhäuser (tenor), has been enticed into the Venusberg, but he wearies of the lewd pleasures of Venus and returns home. There he is reunited with his old sweetheart Elizabeth (soprano) and old friend and rival Wolfram (barytone). But after singing the praises of sensuous love, he is banished, and remorsefully goes on a pilgrimage to Rome. In the end his soul is saved by prayers of Elizabeth and he falls dying on her bier.

Best-known selections are: the 'Overture', the 'Venusberg Music' and 'Bacchanale', Act I; Elizabeth's *Dich, teure Halle*, and the 'March', Act II; 'Pilgrims' Chorus', Elizabeth's 'Prayer' and Wolfram's song to the Evening Star, *O, du mein holder*, Act III.

Music and text by Wagner. Produced Dresden, 1845. German. Three Acts. One of Wagner's early works, written before he abandoned the old opera form.

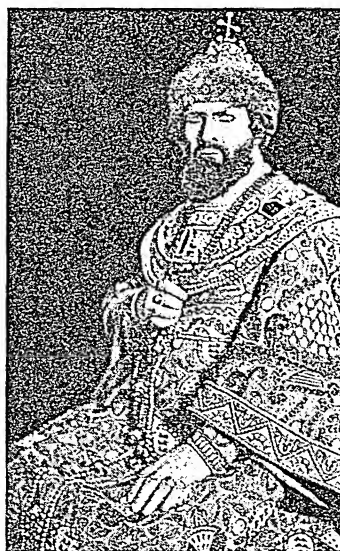
Thaïs (*tā-ēs*). The lovely actress and courtesan, Thaïs (soprano), is converted by the monk, Athanaël (barytone)

'THE LOVE OF THREE KINGS'



In this final scene of Montemezzi's tragic opera, 'The Love of Three Kings', the twisted strands of an unhappy love affair are untangled at last.

A RESPLENDENT CZAR



The great Russian dramatic basso Feodor Chaliapin as Boris Gudenof in Moussorgsky's opera of that name.

the Evening Star, *O, du mein holder*, Act III.

But in converting her the monk himself has fallen from grace. In the final scene as the repentant Thais lies dying in the convent, Athanaël comes, imploring her to fly with him to Alexandria. He sinks in despair at her death-bed.

The beautiful 'Intermezzo', or 'Meditation', symbolizing the conversion of Thais, is the most popular selection.

Music by Massenet; text based upon Anatole France's novel. Produced Paris, 1894. French. Three Acts.

La Tosca. Floria Tosca, a singer (soprano), and Mario Cavaradossi, a painter (tenor), are lovers. Mario, by concealing a revolutionist friend, has come into the power of the malicious Scarpia (barytone), chief of police. Scarpia promises to make the execution of Mario only a sham affair if Tosca will give him her love. She agrees, but stabs him as he advances to her. The execution of Mario is real. Desperate, Tosca jumps over the parapet to her death just as the police arrive to arrest her for murdering Scarpia. The most popular selections are: *Recondita armonia* (Mario), Act I; *Vissi d'arte* (Tosca), Act II; *E lucevan le stelle* (Mario), Act III.

Music by Puccini; text based upon drama by Sardou. Produced Rome, 1900. Italian. Three Acts.

La Traviata (*lä trā-vē-ä'tä*). At a gay party at her salon in Paris, Violetta Valery (soprano), a beautiful woman of loose reputation, meets Alfredo Germont (tenor). They fall deeply in love and are living happily together when Alfredo's father Giorgio (barytone) intervenes, imploring Violetta to

give up Alfredo for the sake of his family's reputation. She makes the sacrifice, Alfredo believing her to be false. He does not learn the truth until it is too late. She dies of consumption in the presence of father and son.

A favorite opera of coloratura sopranos. Well known are *Libiam nei lieti calici* (Violetta, Alfredo, and chorus), *Ah, fors' è lui* and *Sempre libera* (Violetta), Act I; *Di Provenza il mar* (Giorgio), Act II; *Addio del passato* (Violetta), *Parigi, o cara* (Violetta and Alfredo), Act III.

Music by Verdi. Text by Piave, founded on Dumas' 'La Dame aux Camélias'. First production Venice, 1853. Italian. Three Acts.

Tristan und Isolde. Tristan (tenor) is conducting the Irish princess Isolde (soprano) to Cornwall to be the wife of his uncle, King Mark. Isolde, imagining Tristan is indifferent to her, prepares a cup of poison and invites him to drink. They both drink, but Isolde's maid, Brangäne (mezzo soprano) substitutes a love potion for the poison and the two fall under an irresistible spell.

This great singer's playing of Carmen was one of opera's great successes.

When King Mark comes upon the two making love (Isolde is now the King's wife), Tristan is wounded by one of the King's knights. He is carried to his castle in Brittany and there he pines for Isolde. She comes at last just as he dies. She sings the glorious 'Love Death' and dies too.

Generally conceded the greatest love music in existence. The 'Prelude' and 'Love Death' are in the repertoire of most great symphony orchestras.

Words and music by Wagner. Produced Munich, 1865. German. Three Acts.

Il Trovatore (*äl trō-ä-d-tō'rā*) (The Troubadour). The complicated plot concerns Manrico, the troubadour (tenor) who has been brought up by Azucena, a gypsy (contralto), as her son. In reality he is the brother of the Count di Luna (barytone). Azucena stole him as a child to avenge her mother's death. Both the Count and Manrico are in love with Leonora

(soprano). Finally the Count has Manrico imprisoned with his supposed mother. Leonora offers to marry the Count if he will free Manrico. The Count agrees, but Leonora takes

GREATEST OF THE GREAT



The famous Enrico Caruso, tenor, as Canio in 'I Pagliacci', a rôle with which his name will always be associated.

poison and dies in Manrico's arms. The enraged Count has Manrico put to death while Azucena, avenged at last, cries, "You have killed your brother."

Extremely popular. The final act, perhaps the best known of any in opera, includes: *D'amor' sull' ali rosee* (Leonora); 'Miserere' (Choir) and Manrico's *Ah, ché la morte; Ai nostri monti* (Manrico and Azucena). Also popular are *Tacea la notte placida* (Leonora), Act I; the 'Anvil Chorus', and *Stride la vampa* (Azucena), Act II; *Di quella pira* (Manrico), Act III.

Music by Verdi. Produced Rome, 1853. Italian. Four Acts.

OPIUM. Chief of the narcotic drugs which have both helped and harmed mankind is opium, the dried juice from the seed pod of the opium poppy (*Papaver somniferum*). Used as medicine, opium deadens pain. But when it is used for its pleasurable effects, it saps energy and mental strength, and forms a habit which can be broken only with the greatest difficulty.

Opium poppies, with their fragile flowers of red or white or purple, thrive in a hot climate, but cannot endure heavy rain. Since each plant yields but little juice and since the fields must be weeded often, the poppies can be grown profitably only where land and labor are cheap, as in Asia and the Balkans. After the poppies bloom, laborers—chiefly women and children—tediously collect the milky juice from the seed pods. Much of it is shipped to drug manufacturers in Europe, the United States, and Japan, who extract from it opiates—morphine, laudanum, and codein—for medicinal use. The chief opium-growing nations are China, Manchukuo, India, Persia, Turkey, the Soviet Union, and Yugoslavia.

HARVESTING OPIUM IN CHINA



The children are slitting the pods of the poppy blossoms that have shed their petals, and the woman is collecting the juice that flows from the pods with a suction tube. In the older method of harvesting, the juice is allowed to dry on the pod after it flows out of the cuts, and is scraped off the next day.

Opium smoking and eating have long been grave problems in the Orient. In India the government permits the moderate use of opium, but prohibits exports except for medicinal purposes. Use of the drug is prohibited in Japan; in Manchukuo, however, opium production is a government monopoly. China has often tried to abolish opium smoking by forbidding the growth of the opium poppy. It fought the "Opium War" with Great Britain (1839-42) to stop British imports of the drug from India, but was defeated and forced to permit smuggling. In 1935 the Chinese government took over the control of opium and established cure centers.

Ancient peoples used opium medicinally as early as the days of the Assyrians. In the Middle Ages Arabs introduced it into India and China, and its use spread into Europe. In the 18th and 19th centuries, almost all "pain killer" medicines contained opiates. When the people of the United States came to realize the habit-forming property of these medicines, state and federal laws were enacted to drive them off the market. Physicians now prescribe opiates only to relieve pain and to bring needed sleep (see Drugs; Narcotics).

The first international opium conference met at Shanghai in 1909 at the suggestion of President Theodore Roosevelt. Later conferences at The Hague in 1912 and at Geneva in 1925 and 1931 resulted in treaties designed to regulate the opium trade. Three permanent international organizations watch the traffic and suggest measures for controlling it. Despite these efforts, enormous quantities are smuggled into the chief countries of the world and peddled to addicts.

OPOS'SUM. The peculiar way in which the opossum rears its young sets it apart from all other American animals. As many as a dozen may be born at a time, each about half an inch long. At once they crawl into a pouch on the mother's abdomen. There they fasten themselves to the milk glands and remain helpless for about six weeks. When they first come out of the pouch they are the size of mice. For some time after that they ride around on their mother's back, clinging to her fur and crawling back into her pouch to sleep.

This way of rearing the young is peculiar to the group of mammals called *marsupials* (from the Latin word *marsupium* for "pouch"), including kangaroos, wombats, "Tasmanian devils," and bandicoots. The opossums of North America and their relatives in South and Central America are the only marsupials now found outside the Australian region.

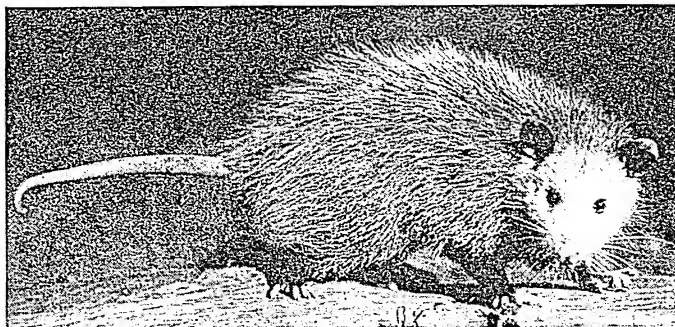
When full grown, the common opossum is about the size of a house cat (33 inches to the tip of the tail). The head is small, but has long narrow jaws set with 50 teeth. The feet are five-toed. Each toe on the forefoot has a long sharp nail that helps in climbing trees. Four toes on the hindfoot also have nails. The nailless first toe is used like a thumb to grasp branches. The tail, long and ratlike, also helps in climbing. There are two coats of fur; the inner coat is soft and short, and the outer is coarse, long, and a grizzled gray in color.

During the day the opossum sleeps in a burrow, brush pile, hollow log, or tree. At night it hunts in trees or on the ground. It grows fat from eating birds, frogs, fish, eggs, insects, and fruit. It climbs to the tips of branches to get cherries, mulberries, and persimmons. But its slowness makes it an easy prey of owls, wolves, coyotes, wildcats, foxes, and bears.

Hunting the opossum with dogs is a favorite sport in the South on autumn nights. When surprised by a hunter, the opossum pretends to be dead. From this trick has come the expression "playing 'possum." The flesh is enjoyed by some, and the fur is prized for making women's coats.

Range of common opossum (*Didelphis virginiana*): Florida to New York; Texas and the Great Lakes to Atlantic Coast. The Texas opossum, which is all black at certain seasons, is found in southern Texas. The Florida opossum, a slightly smaller variety, ranges from Florida to western Louisiana.

YOU SELDOM SEE HIM BY DAYLIGHT



The opossum usually sleeps in the daytime and does its hunting at night. Notice the long ratlike tail with which it can take hold of things.

LITTLE TALKS ON GREAT THINGS *by Arthur Mee*

OPTIMISM

THE hope of the earth is the optimist looking forward and believing all is well. There are pessimists everywhere, despairing of humanity, believing in the doom of all things; but the faith that is based on reason refuses to be mocked and told that life is an empty dream. The optimist believes, with Longfellow, that "life is real, life is earnest."

The difference between the optimist and the pessimist, between faith and cynicism, is largely the difference between knowledge and ignorance. We may be swayed by sentiment into feeling that evil holds the world, but all the history of the past replies that good will come. If we are to be optimists let us base our faith on the solid ground of fact and reason; let us know *why* we believe. And what is the foundation of sane optimism in a world like this? It is founded in history, which shows us that all the ages have led men on to higher things and greater powers, in spite of dark periods of evil. The world of today is beyond all the dreams of yesterday; the world of tomorrow will be greater than we can think.

The Immeasurable Future

The mind that understands the past will shrink from no vision of the future that imagination can conceive. A few thousand years have opened up the entire field of human knowledge; a few hundred years have "made us masters where we were slaves." What, then, is impossible in millions of years? Who knows that the ages in which this book appears will not be like a moral Stone Age before the world is 20 lifetimes older?

The mysterious power of man, the mighty processes of chemistry, the strange promptings of the soul, the throbbing in ethereal space—who shall set a limit to illimitable things like these? Man does not even know whether he is alone in the universe. He has no reason to be surprised if tomorrow the mighty atom should suddenly release its power and banish poverty and weariness for human kind. He need not be surprised at anything that radium does, or at any new powers discovered in the ether. He will certainly ring up the other side of the world as readily as he rings up his neighbor, and only dull folk will be surprised if a dozen things as startling as that happen in the next decade.

A man in a laboratory may do more for his race in a day than all the parliaments of Europe in a generation. A man in a scientific workshop may give us means of investigation inconceivable to us now. Who, before the microscope was invented, could have dreamed of the wonder in the tip of a root? Who, before the telescope came to peer into infinity, could have guessed the unfathomable wonder of the heavens? Who could have dreamed, even when the microscope came at last, that this scientific toy would save more lives in one generation than all our laws? Man can change the lives of animals and plants, raising new kinds of either. He can enormously modify or develop the two great branches of life and its kingdoms. Who knows that the future may not hold within itself the secret of some intellectual advance of man corresponding with his advance in other realms? How many years will it be before the American man of science ranks as much above an Edison as an Edison does above a charlatan? We can produce wheat free from rust; why not *men* free from disease? One thing is certain: the discoveries of new powers and their applications will be immeasurably beyond all human experience, and the child born in the World War will live on into a world now beyond imagination.

It is not the scientific but the unscientific mind, says Darwin, that sets limits to the possibilities of knowledge; and it is ignorance, and not wisdom, that talks of Evolution as if it had stopped.

The Past a Prophecy of the Time to Come

The promise of what man yet will do is in the things that man has done, but beyond all possible comparison will be the wonder of the things to come. What is the stopping of war compared with the things that man has done? It is child's play. The wildest visions of the dreamer are not wilder than the visions of Marconi would have been when he was born. The wildest vision of the sea without a battleship, or a state without a gun, is not wilder than the vision of the world we live in would have been to Aristotle and Shakespeare and Newton. We know there was a world they did not dream of, for we live in it; what right has any man to say that there is not another world, and others after that? The only

environment our first ancestors knew may have been water, until some great explorer, some microscopical Columbus, found the world of air. It was a world beyond all their imagining, but there was still another world, found by some Newton-like *amoeba*, who felt the warmth of the sun on some sensitive spot, and discovered light and heat. Who are we, with new worlds opening round us year by year, to say that life has no more chambers to unlock!

We may be disappointed that the world has not reached perfection after a hundred centuries of history and 19 centuries of Christianity. But this world will never reach perfection, for perfection changes with every age that comes and every age that goes. The vision of the fathers is the realization of the children; but the children's visions only the children's children see. "To travel hopefully," says Robert Louis Stevenson, "is a better thing than to arrive." We must travel hopefully. We must not be discouraged because Life is a journey without an end; we must agree rather with the wise German who loved truth and said that if God were to offer him the truth in one hand and the search for truth in the other, he would take the search for truth.

A Long Apprenticeship but It Paid!

For a thousand centuries the human race moved slowly; for a hundred centuries men have built up cities and filled them with beautiful things; but the great quickening-up of the world is hardly one century old. It is as if man had served a long apprenticeship and suddenly awakened to his powers. Man has had a million years at least upon the earth, but in civilization only a few hundred lifetimes. He is only a step or two on his great march to the conquest of the earth, but already he stands at the gates of a new dominion. He has found new powers over the forces that he knows, and is peeping on tiptoe through the keyhole of an unknown world.

It is nothing that a thing should seem incredible; it is the constant incredibility of the world that staggers thinking men. In the *amoeba* days who could have guessed that the gigantic lizard-like *dinosaur* would come? In the *dinosaur* days who could have guessed that man would come? In the cave days of man who could have guessed that Shakespeare would come? And who, in Shakespeare's day, except perhaps some poor wild Roger Bacon—the 13th century friar—could have conceived the Wireless Age?

Has the movement of the world been good or ill? Only an idiot doubts. The world does not need defense or vindication. Has Human Evolution been long or slow? It has been almost

like a lightning flash compared with Nature's Evolution. Side by side with the unknown millions of years of preparation, civilized mankind is but an hour or two old. Through how many millions of years animal instincts were weaving themselves into the life of man we do not know; we do know that but a few thousand years have gone to crush them out of him. We know that in a few thousand years the savage creature of the wilds has changed into a Milton or a Florence Nightingale. We know that in this same few thousand years the brother of the wolf has become the faithful guardian of the child. Those who know all these things will not refuse to believe that in a few more years we may see such miracles again.

Science Will Set All Men Free

In the new age that is coming science will give us power, and power will give us leisure. Industrial slavery will go the way of physical slavery, and men will give their reasonable labor, and not their bodies and their souls, for bread. In olden days it took 400,000 men to do the work that one train will do. We are beginning to use the power of the sun and the running rivers, and Niagara has power enough at the Falls to do the work of all America. If all the power of Niagara could be harnessed it would give every human being in America a power-slave of his own. It is said that in the great days of Athens every freeman had five slaves who did his bidding; and it is reckoned that in this country now, if we take the power of coal alone, every family has the equivalent of 20 slaves to do its bidding.

Forever great events are in the making; never a day but some seed is sown that will bear unexpected fruit. This seed of great events—how ever wonderful it is! The Austrian monk Mendel, growing peas in his monastery garden—who could have seen that he was discovering the laws of heredity and forging a weapon to drive back insanity and build up a stronger race? Dr. Ronald Ross in India, examining mosquitoes until he fell asleep—what daring prophet could have seen the Panama Canal in that? An old man bending for hours over a flower on his English hilltop—who that saw him could have dreamed of the glorious conception of the universe that Darwin was building up for mankind? Pasteur poring over his test tubes and his microscope—who knew that the beginning of the end of disease was there?

There is no limit to the promise of the future. We do not produce Shakespeares and Miltons, but we do produce Edisons and Pasteurs and Listers; and there have been among us in our time men whose names will endure when some of the stars in the sky have ceased to shine.

ORANGE. The orange, carrying its golden beauty and fine fragrance and flavor unchanged around the world, is commercially the most important of the fresh fruits. The apple, it is true, is the long established king of the temperate zone markets, but the orange, grown in all tropical and semi-tropical countries, is offered for sale from the Equator northward to the farthest limits of civilization. The commercial value of the grape is greater than the orange, but the grape rules not as a fresh fruit but through its products—dried as raisins and currants, and manufactured as wine, grape juice, and jelly.

The wild orange was early cultivated and has been carried westward with the march of civilization, each new era opened developing greater importance. Originally a native of eastern Asia, it became a valuable crop in Asia Minor and the Mediterranean regions, establishing itself in the sunny mild climate of Italy, Spain, and southern France. The Spaniards brought the orange to the West Indies, Brazil, and Florida, and the Franciscan fathers planted it in California. Early in the 19th century orange groves were planted in Florida, and in 1894, 6,000,000 boxes were sent to market. Then came a

freeze in December and another in February which ruined or badly damaged all the orchards north of the middle of the state and killed those of Louisiana. The Florida groves quickly recovered and today the Indian River orange is among the choicest on the market.

The development of orange culture on a large scale in California came as an indirect effect of this check to Southern production. Today California could fill a train of box cars stretching from New York to Boston and six miles farther out into the Boston harbor with the golden crop of one season. In the United States the demand for oranges is very large, and California supplies two-thirds of it. Even England is using an ever-increasing quantity of California oranges, and new areas of culture are developing in Arizona, Texas, and the other Gulf states.

The great orange of commerce is the seedless, fine-flavored Washington navel, which has a funny little wrinkled orange no bigger than an olive tucked into the blossom end. This was the first seedless orange ever marketed. In 1872, a United States consul to Brazil discovered that in Bahia, Brazil, a few orange trees bearing seedless fruit were growing, and he forwarded some shoots of this seedless variety to the

Department of Agriculture at Washington, which sent them to an orange grower in California. Two of the shoots lived, and bore seedless fruit of much finer quality than the original Bahia variety. From these two trees, which are still alive, has come the great navel orange industry. One of the chief merits of the American navel is that it can, unlike the Bahia variety, be picked ripe and kept for months, and sent great distances without deterioration.

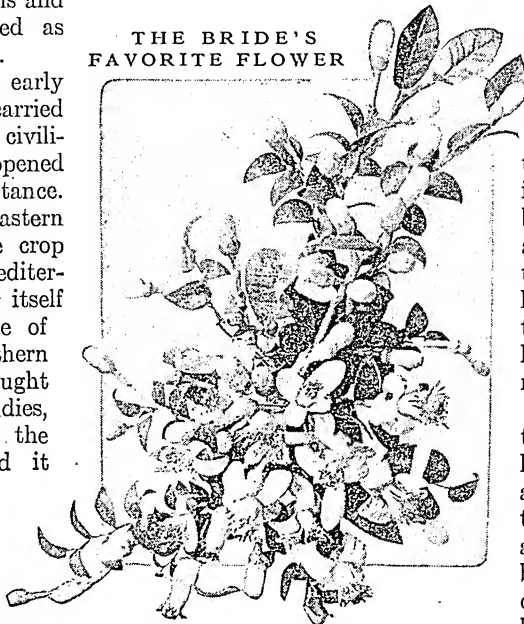
Orange trees begin to bear when they are about six years old. The best oranges are produced by budding desired varieties on seedlings (trees raised from seeds) of hardy stock. The trees bear more or less continuously, and flowers and fruits in all stages of development can be found on the same tree at almost every season throughout the year. Most of the fruit, however, becomes ripe at one time, and the California crop is harvested in time for the Christmas trade.

An orange grove is so fragrant that you can smell it nearly a half-mile away, and the birds and bees come to it by the thousands. The golden fruit and the white blossoms—the bride's favorite flower—and the dark polished leaves are very beautiful. The trees are planted in regular rows and stand about 25 or 30 feet apart. They require regular pruning, and must be

sprayed and fumigated often to destroy the various pests that feed upon them. Ladybugs eat the scale insects, one of the most persistent pests, and are a great help to the growers in their fight. In the largest orange-growing districts of California, irrigation is necessary. Weather conditions must be noted, and if there is any danger of frost everything must be in readiness to light fires throughout the groves. In many big orchards a system of alarm bells connected with the thermometer arouses the sleeping workmen when the mercury reaches the danger point. The fires are built in small wire baskets or pots of crude petroleum, producing a dense warm smoke blanket which keeps the temperature above the freezing point.

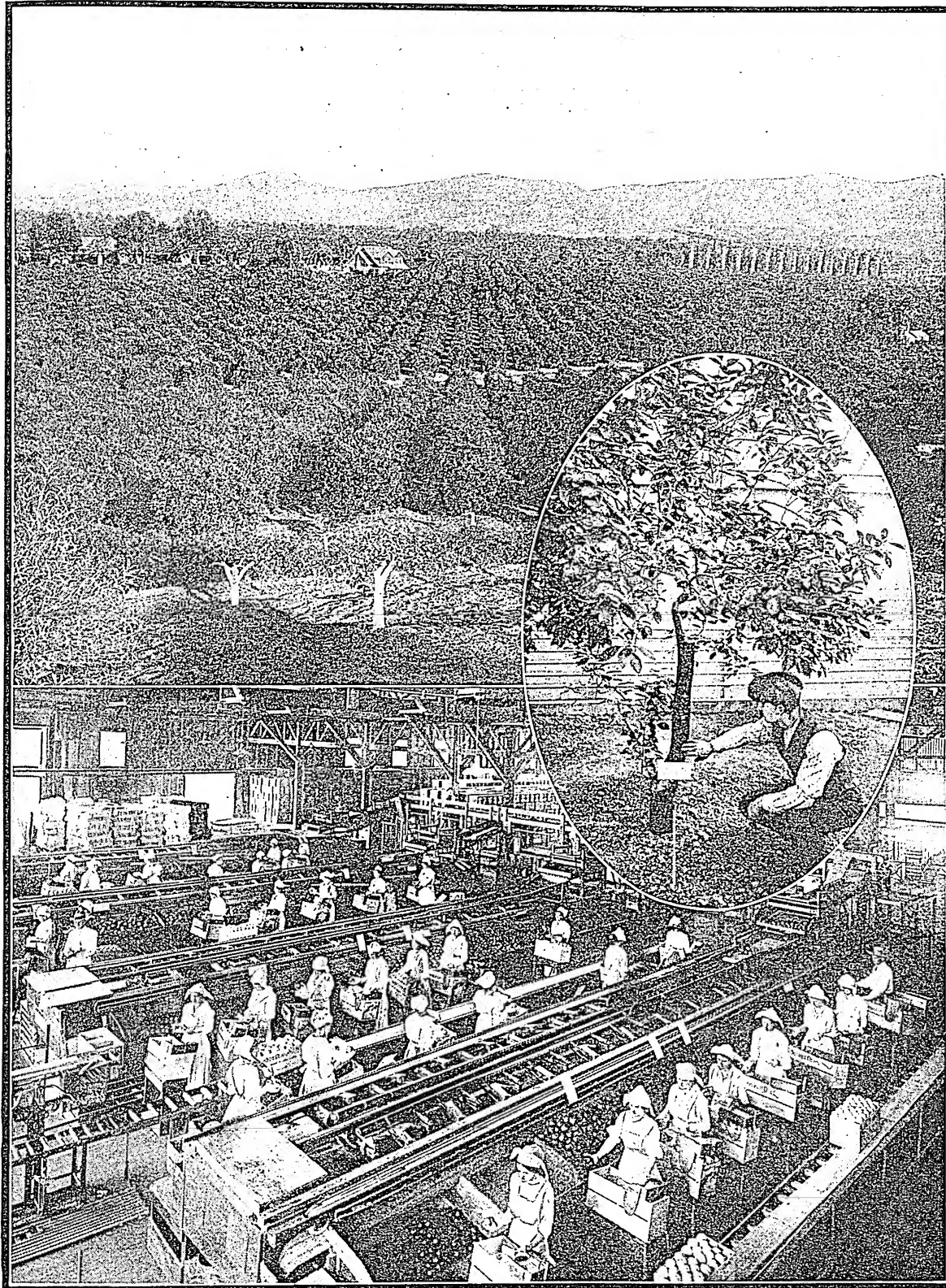
But the battle is not over when the crop is ready to harvest. Every precaution against injury to the fruit is taken. The oranges are cut from the bough with scissors and only very short stems are left, so they will not injure their neighbors. The pickers wear canvas gloves to keep their nails from scratching the skin, for the least scratch may open the way for the germs of decay. At the packing house the

THE BRIDE'S
FAVORITE FLOWER



The white waxlike orange blossoms are of extraordinary fragrance. So powerful is the odor from these lovely flowers that an orange grove can be detected half a mile away.

A VAST INDUSTRY FROM TWO LITTLE TREES



The tree in the oval picture is one of the two original trees from which has been developed the great navel orange industry in the United States. At the bottom is a shipping station, where the oranges are sorted and carefully wrapped in tissue paper before they are packed into cases. At the top is a typical California orange grove.

oranges are carefully sorted and graded, wrapped in tissue paper stamped with the name of the firm, and packed in boxes close enough so they cannot move. A box holds from 96 to 200 oranges, according to the grade or size of the fruit. The culls may be converted into orange juice, orange oil, or dairy feed.

Tangerines or mandarin oranges are small and fragrant, with loose skin easily separated from the pulp and the sections of the pulp easily separated from one another.

Kumquats are a fruit related to the orange. They are an inch or so long with a thick skin and not much pulp. They are eaten skins and all, and are made into a delicious conserve. The bitter orange, an Arabian variety, was brought into Spain by the Moors. The Maltese, or blood orange, is so called because of the deep red tint of the pulp.

Scientific name of sweet orange, parent of most cultivated varieties, *Citrus sinensis*. The bergamot orange, *Citrus bergamia*, supplies bergamot oil, so largely used in the manufacture of eau-de-cologne and other perfumes. Scientific name of tangerine, *Citrus deliciosa*. It is a small tree with very dense foliage and the fruit has seeds of a greenish color.

ORANGE FREE STATE. A British colony in South Africa, lying between the Orange River and its tributary the Vaal, one of the first members of the Union of South Africa. Until its conquest by the British in the Boer War (1899-1902), it was an independent Boer republic, first settled in 1836. For the most part it is a prairie country, affording excellent pasturage in the summer. The chief industry is the raising of cattle, horses, sheep, goats, ostriches, etc. There are valuable diamond mines and some coal. The climate is healthful and agreeable. Bloemfontein (population, about 65,000) is the capital and largest town. Population of the colony, about 775,000, of whom only about 200,000 are whites.

ORANG-UTAN. The name of this member of the ape family, found in the swampy forests of Borneo and Sumatra, comes from the Malay language and signifies "man of the woods." It is well named, for like the chimpanzee and the gorilla, it approaches closely to man in appearance and structure. A full-grown male occasionally reaches a height of four and a half feet, but the outstretched arms cover more than seven feet. The body is bulky and covered with long, reddish-brown hair. The legs are short, but

the arms are so long as to reach the ankles when the animal is erect, and in walking the knuckles are placed on the ground. Orang-utans, however, are

awkward on the ground and prefer the trees, where they can travel at the rate of five or six miles an hour, without special effort, by swinging along on the branches, which they grasp mainly with their hands. They feed on fruits and succulent shoots, being strictly vegetarian in their diet. They get most of their food on the trees, but go to the ground for water. They live in pairs. As a rule they are peaceable, but when disturbed they are fierce fighters. They retire to rest at sundown in nests of broken boughs 20 or 30 feet above ground. In captivity they are teachable and the changing expression of the face makes them most interesting, though they are not so active and intelligent as the chimpanzee. Scientific name, *Simia satyrus*.

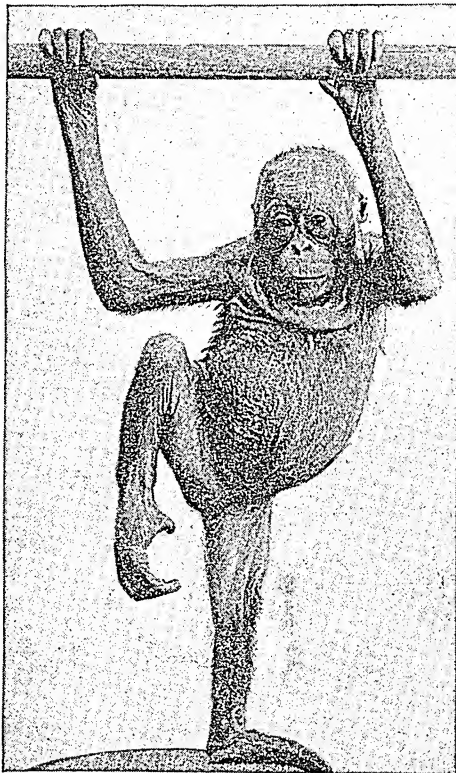
ORCHESTRA. When we watch a brass band, we see men playing horns and drums. When we look at a military band we see the same horn and drum groups, and with them a group of players using flutes and clarinets and other wood-wind instruments. When we listen to an orchestra we find, besides all these, still another and larger group playing stringed instruments.

This, then, is the difference between an orchestra and a band—that when we listen to an orchestra we really hear four "bands" in one! There is the *string* "band" made up of various members of the violin family, the *wood-wind* "band" made of all the wind instruments that are made of wood; the *brass* "band," with its various kinds of "horns"; and the noisy group of big and little drums, and all the other queer *percussion* instruments that are struck or beaten. All large orchestras also have one or more harps.

The "strings" form the foundation of the modern orchestra. They are capable of the greatest variety of expression in giving voice to the depths and heights of human emotion. The violins sing the soprano; the second violins the alto, the violas the tenor, the violoncellos (or "cellos") the baritone, and the double-basses (or bass viols) the bass (*see Violin*).

Next in importance is the wood-wind group, which is divided into three families. The first family consists of the flute, which with its clear sweet liquid

A YOUNG "MAN OF THE WOODS"



In general appearance the Orang-utan is not as manlike as the gorilla, but the form of his head, particularly in the young ones, is more like that of man than either the Gorilla's or the Chimpanzee's.

notes is the most agile and flexible of the woods; and the piccolo, a shriller flute which has been called "the imp of the orchestra." The second includes the oboe, with its plaintive pastoral tone, and the deeper English horn and bassoon, which may be regarded as alto and bass oboes. The third comprises the clarinets, which are known by their full rich mellow tones. There are usually three of these of different pitch. Oboes and clarinets, as distinguished from the flute family, are reed instruments.

The "brasses" consist of the French horn, which is the old hunting horn adapted to orchestral purposes; the trumpet, with its full round brilliant tone (often replaced by the cornet); the majestic trombone, an instrument of great range and power, and the deep-toned tuba, the bass of the brass band (see Horn, Musical).

Of the percussion instruments, often called "the battery," some produce "noises" rather than definite musical notes. Such are the bass and snare drums, triangle, cymbals, etc., whose purpose is to accentuate the rhythm or add to the volume of sound, to help to produce various descriptive effects (see Drum). The kettle-drums, or *tympani*, however, which are among the most interesting instruments in the orchestra, can be tuned to sound certain notes. The bells, "glockenspiel," or "carillon," and the steel plates of the celesta likewise have a definite pitch.

What a marvelous thing an orchestra is! As someone has said: "It holds within itself nearly every kind of tone from the deepest rumble of the bass tuba and growl of the double-bass to the cool, flowing tone of the clarinet and bassoon and to the penetrating call of the flute, the cry of the violin, and

the scream of the piccolo. It holds within itself every kind of vibration from bowed, or plucked, strings, and air blown upon quivering reeds, or through pipes, or tubes, or horns; it has every kind of thump on tightly stretched skin; it has every kind of rattle, clang, and clash; and every kind of sharp blow, from the heavy stroke on the steel rods to the silvery notes of bells, or the brilliant fiery sparks from the triangle."

Every instrument in the orchestra has been hundreds of years in developing to its present perfection (see Musical Instruments). So has the music it plays for us. Even the name "orchestra" comes to us from the Greek language of long ago. It meant the "dancing place" and the name came to be given to the instrument players because in the old Greek theater those players used to be placed in the circular space in front of the spectators, where the chorus danced and sang.

The early orchestras were very different from the great orchestras of today. About the time that the first white people came to live in America, the orchestras in Italy, which was then the

chief home of music, had less than a score of instruments. One of the best remembered of these organizations had only seven—one harpsichord (the forerunner of the piano), one guitar, one viol, one lute, and three flutes. The great orchestra of the French conductor Berlioz, 200 years later, used 100 stringed instruments, 18 woodwinds, 49 brasses, 18 drums, three pairs of cymbals, and a gong! A modern symphony orchestra consists of from 60 to 100 musicians. A typical one is made up as follows: 16 first violins, 14 second violins, 10 violas, 10 violoncellos, 8 double-basses, 3 flutes, 2 oboes, 1 English

A PAGE OF AN ORCHESTRAL SCORE

Allegro. *Andante*.

Great orchestral conductors often retain dozens of long scores in their memory, so that they need not watch the music during a concert but may give all their attention to the musicians. You can get some idea of what a task this is when you understand that each staff of the score represents the music for only one group of instruments.

A FLOWER-QUEEN OF THE TROPICS



For variety of shape and color, as well as for strange habits, the Orchids lead the plant world. The one shown here is a variety of the Rosy-Lipped Cattleya (*Cattleya labiata*). It is found wild in Brazil growing on the trunks of trees. The flowers, spreading like giant butterflies, are often six inches or more across.

horn, 3 clarinets, 3 bassoons, 4 trumpets, 4 horns, 3 trombones, 2 tenor tubas, 2 bass tubas, 1 contra-bass tuba, 2 pairs of kettle-drums, bass drum, cymbals, harp, celesta, etc.

With so many instruments playing together it is very important to have a leader or conductor to indicate the time and to preserve the proper balance between the groups. How complicated his task is you realize when you look at the many lines of notes on each page of a conductor's score. Besides indicating the time and the expression the conductor also usually signals each solo player or group of players when they are to enter, if they have been silent for a few bars.

Almost every large city of Europe has at least one symphony orchestra, and there are scores of such organizations in the United States.

ORCHID (*ôr'kid*). Fabulous prices have been paid for a single rare specimen of the remarkable orchid family of plants. These flowers are so exquisite in their delicate colorings of rose and lilac, yellow, white, and green, so pleasing in their violet or orris-root fragrance, and so graceful in many of their forms, that they have become the favorites of florists and all flower-loving folk. So great is the demand that thousands of dollars' worth of them are imported annually from South America, the East Indies, the Philippines, and even from Australia. And many an eager collector has climbed precipices, waded through malarial swamps, endured all dangers of tropical forests, and braved even the head-hunters of Borneo to get these treasured flowers. Indeed, to prevent their total extinction some South American governments have put a stop to all orchid collecting.

Some orchids grow upon the ground as do so many of the other flowers, and some grow in wet marshy places and live on dead organic matter. The most valuable group are the air plants, which grow on tree trunks and branches in tropical and subtropical regions, obtaining their nourishment not from the support that some of their roots cling to but from

their long spongy aerial roots which absorb the dust blowing around them as well as other food given by the moisture-laden atmosphere (see Air Plants).

Their flowers in color and form are often so close an imitation of queer bright-colored bees, butterflies, frogs, and lizards that the flower-destroying insects pass them by. All members of the family have various schemes for getting pollen-carrying insects to visit them. Inside the walls of the flower are tempting juices, but to reach them their insect visitor must first pass through the wonderfully constructed "lip," a conspicuously colored modified petal. These callers pay for their feast by carrying pollen masses away with them. Some orchids give their insect visitors a bath of nectar so as to make them crawl with wet wings up a certain path where they touch the pollen masses and stigma; some hurl their pollen masses at them, and others have various and no less remarkable devices to make sure that fertilization is properly carried out.

One species of orchid furnishes the vanilla of commercial use, and another the medicinal salep (see Vanilla). The orchids include not only the rare hot house plants but certain more familiar species, such as those delicate and fragile wild flowers of our woods, the ladies tresses and the ladyslippers. Among the latter, the showy ladyslipper most closely resembles the orchid in appearance (see Ladyslipper).

There are more than 400 genera of the orchid family (*Orchidaceae*) and the number of species is variously estimated at 6,000 to 12,000. About 75 species are in the United States (including Alaska); fully 3,000 species are under cultivation. They thrive in all parts of the world where it is not too hot or too cold, and are divided into two general groups—the East Indian and the South American. Orchids are the most highly organized flowers among the monocotyledons. These perennial herbs have simple stems, often arising from bulbs; simple leaves; showy irregular flowers with three beautifully colored sepals and three petals, one of which, the labellum or "lip" is long, fringed or sac-like. The one or two stamens are united with the pistil, and the one-celled ovary contains about a million tiny ovules. The pollen is held together in masses by cobweb-like threads.

SCENES of Grandeur and VISTAS of Opportunity in OREGON

OREGON. Oregon is a part of the "last-won wilderness" of the American domain. With the state of Washington, it came directly under American rule without having first been owned and governed by some foreign power. Great

Britain was sovereign of the thirteen original colonies; France ruled in the territory of the Louisiana purchase; Spain in Florida, Texas, California, the Philippines, and Porto Rico; Russia in Alaska; and the

Extent.—East to west, 380 miles; north to south, 280 miles. Area, 96,981 square miles. Population (1940 census), 1,089,684.

Natural Features.—Cascade Mountains (Mt. Hood, 11,253 feet; Mt. Jefferson, 10,495 feet; Three Sisters) separated from low coastal range by Willamette Valley; eastern half a rugged plateau broken by a number of lakes and the Blue Mountains in northeast. Principal rivers: Columbia, forming part of northern boundary, and its tributaries, the Willamette, Deschutes, and Snake. Mean annual temperature, 48°; mean annual precipitation, 26°.

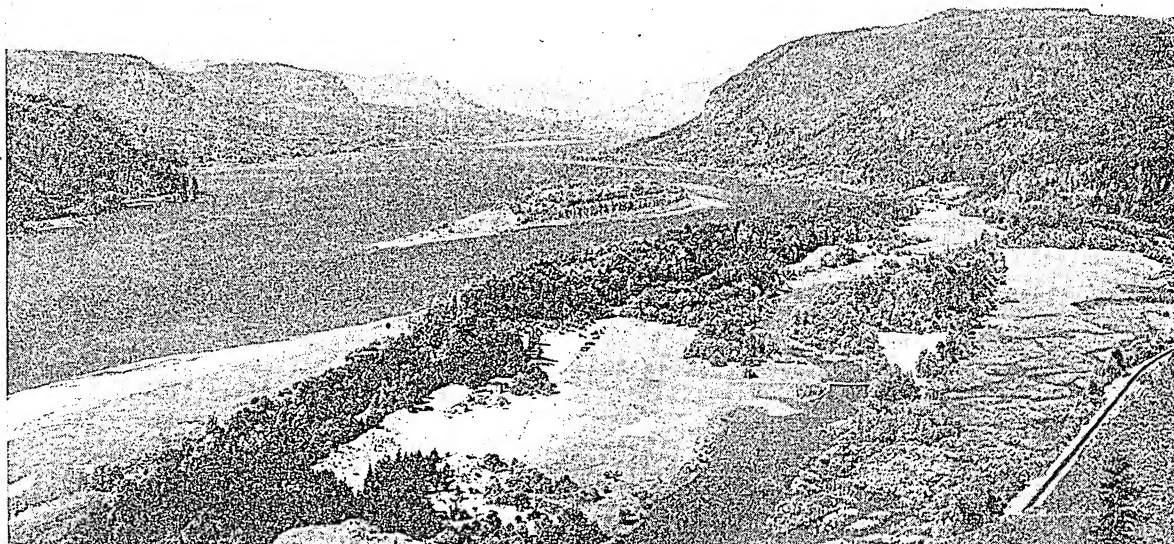
Products.—Wheat, hay, oats, hops, flax, potatoes, apples, small fruits; live stock, wool, dairy products; poultry and eggs; stone, cement, mercury; lumber products, paper and pulp; canned goods (chiefly salmon); flour and mill products; salmon, trout, halibut.

Cities.—Portland (305,394), Salem (capital, 30,908), Eugene (20,838), Klamath Falls (16,497), Medford (11,281), Astoria (10,389).

native kings in Hawaii. But the "old Oregon" territory may be said to have come under the Stars and Stripes when it first emerged from the wilderness. For although the region was claimed by Spain, Russia, and Great Britain, as well as

the United States, and for 20 years the "Oregon Country" was occupied jointly with Great Britain, the title of the United States south of the 49th parallel was definitely recognized in 1846.

A. SUPERB STRETCH OF THE COLUMBIA RIVER



This majestic panorama of the Columbia River was photographed from Crown Point on the Columbia River Highway in the heart of the Cascade Mountains. Crown Point is on the Oregon side, more than 700 feet above the surface of the river.

The Columbia River separates Oregon from the state of Washington on the north. This river is famous not only for its scenery, but also for its salmon fisheries, which are one of the state's most profitable industries. Bonneville Dam, 42 miles above Portland, provides hydroelectric power for the manufacture of aluminum, calcium carbide, and other products. The dam also deepens the river and with canals and locks enables ocean-going vessels to travel 175 miles inland to The Dalles (*see* Columbia River; Dam). The Snake River, chief tributary of the Columbia, forms more than half of the eastern boundary between Oregon and Idaho. On the south lie California and Nevada; on the west is the Pacific Ocean.

Oregon is divided by great mountain barriers into regions of fertile valleys and barren deserts. From a narrow coastal plain rises the low, rolling Coast Range. In many places its jagged spurs reach across the sandy beaches into the sea. This western slope is warm and rainy; the vegetation on the mountain flanks, jungle-like in its luxuriance. In the river valleys, with their lush grasslands, are the state's largest dairy farms.

The Cascades and the Willamette Valley

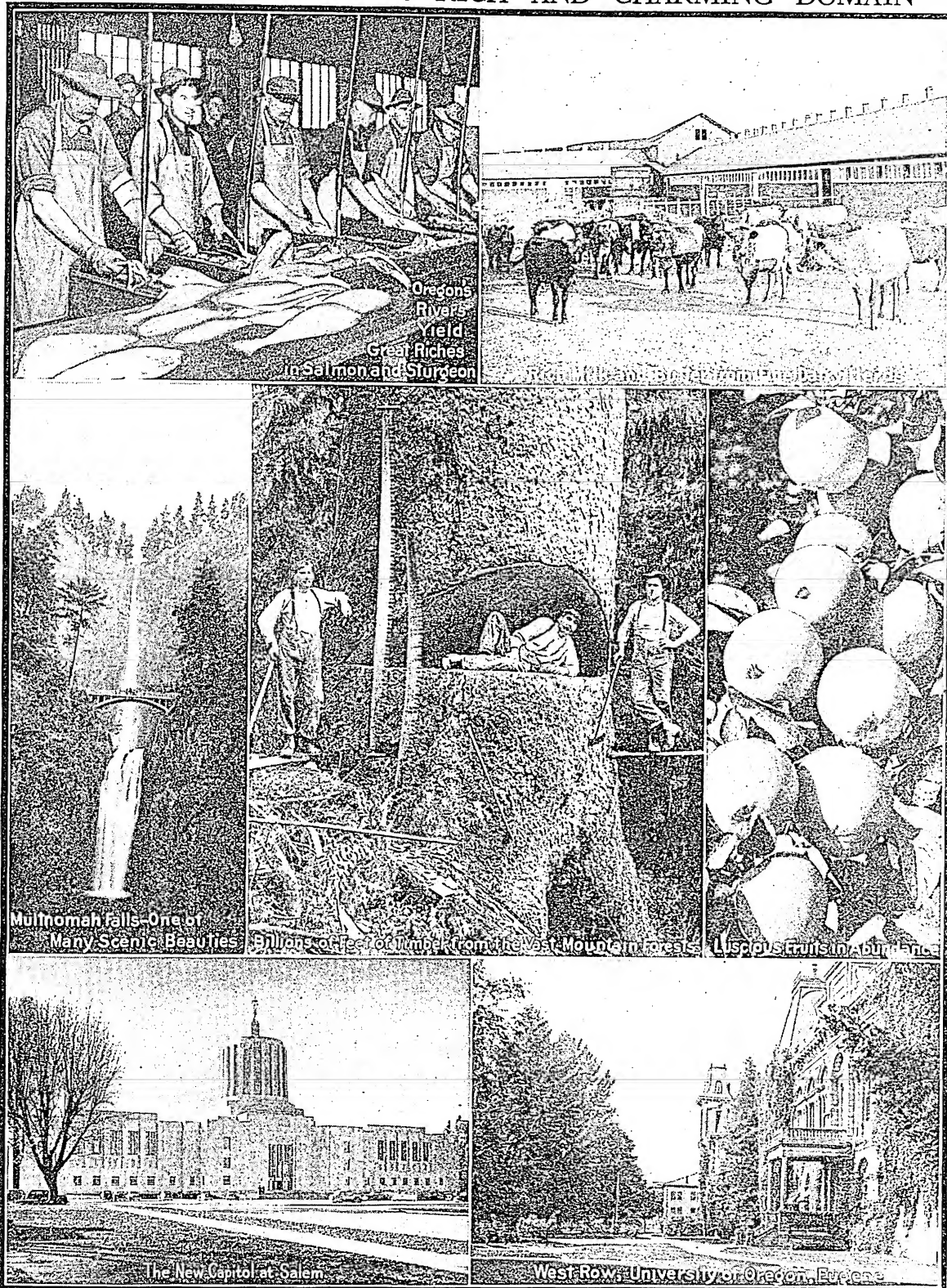
A hundred miles from the ocean, parallel to the Coast Range, runs the white line of the Cascade Mountains, breaking into shapely volcanic peaks so individual that the Indians thought of them as gods who at times threw stones at one another. Throughout the range are fir-shadowed lakes and singing rivers. Snowy Mount Hood, 11,253 feet high, and Crater Lake National Park are among the many scenic attractions (*see* Cascade Mountains; National Parks).

Between the two mountain ranges lies the rich Willamette Valley, a trough about 180 miles long and 60 miles wide. It is drained by the Willamette River, which flows north to join the Columbia near Portland. In this valley live two-thirds of the state's people. It receives less rain than the seaward slopes of the Coast Range but enough to support a highly diversified agriculture. It is one of the nation's greatest fruit- and berry-growing regions. In the production of hops it leads the country. Its orchards of English walnuts and filberts are second only to California's. Winter wheat is also an important crop. Portland, Salem, and Eugene, the three largest cities in the state, are in this valley.

The Semiarid East

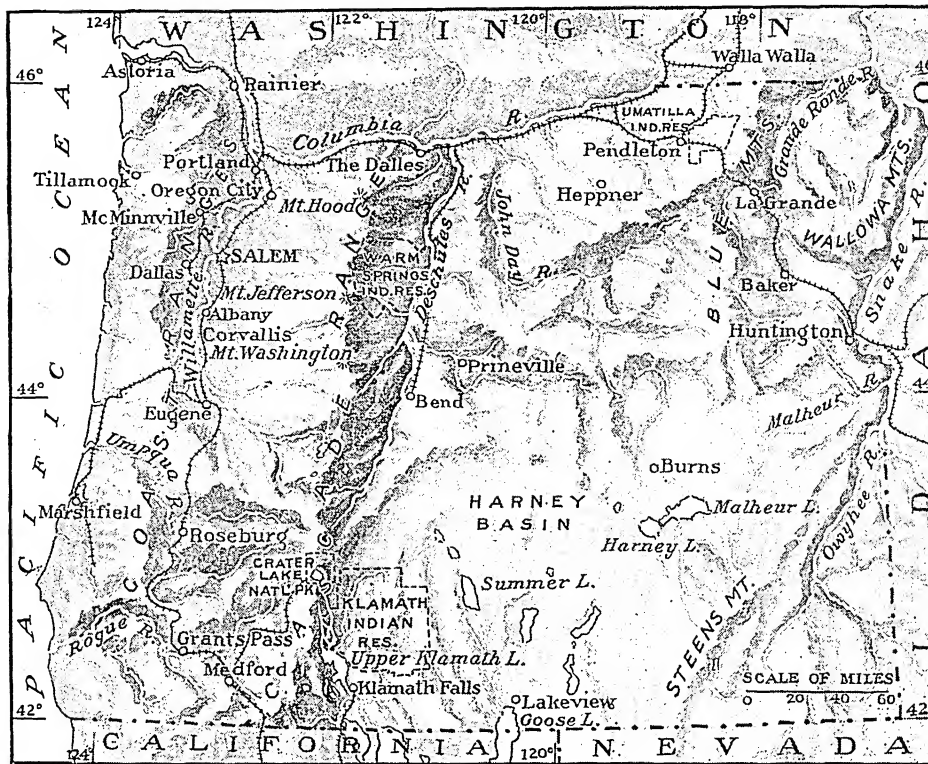
Two-thirds of Oregon lies east of the Cascade Mountains. In climbing over this high, cold barrier, the warm winds from the Pacific lose much of their moisture. When they blow down upon eastern Oregon they bring hot, dry summers and cold, snowy winters. The northern half is a great plateau built up by repeated outpourings of lava from the Cascades. The Blue and Willowa mountains, partially buried by the lava, rise like islands in a sea of basalt 2,000 to 3,000 feet above the surface of the plateau. The rivers have carved fearful canyons in the lava. Hell's Canyon on the Snake River is 8,000 feet deep at some points. The region receives 10 to 20 inches of rain annually. The southern section is more arid, with large areas of lifeless desert. Great herds of cattle and sheep roam the plains, and in the north are broad fields of wheat, oats, barley, and hay. More than a million acres of eastern Oregon are irrigated.

FEATURES OF OREGON'S RICH AND CHARMING DOMAIN



Most of Oregon's wealth is the direct gift of nature, drawn from her rivers, forests, fields and orchards. And as yet she has barely tapped her resources, for practically the whole interior of the state awaits development. Fish, timber, cattle and dairy products, and fruits and vegetables are among the leading sources of wealth. The scenery of the state is superb. Below we see the state Capitol at Salem, replacing the one destroyed by fire in 1935, and at the right a portion of the University of Oregon at Eugene.

WEALTHY TODAY—GREATER WEALTH TO COME



AGRICULTURE

MANUFACTURING

TRADE AND
TRANSPORTATIONOTHER
OCCUPATIONS

Oregon still has vast untouched resources. As you can see on the map, the state is settled chiefly around its edges, while the great central basin awaits development. Above you see how the leading occupations compare.

From the mountains everywhere timber is cut—Douglas fir, ponderosa pine, hemlock, spruce, and cedar. Oregon is second only to Washington in lumbering, and lumber products are the most valuable manufactured goods. The Pacific coast and Columbia River fisheries are important. Salmon is the leading catch, but halibut, pilchards, cod, trout, shad, and oysters are also taken. Canned fish and canned and dried vegetables and fruits are the second most important factory products. The aluminum industry was the first to take advantage of hydroelectric power available from Bonneville Dam. Shipbuilding and the manufacture of paper and woolen goods are centered at Portland (see Portland).

There are many minerals. Oregon is second to California in the production of mercury and chromite, and it ranks third in platinum and diatomite. Other important minerals include gold, silver, and copper.

This prosperous country supports many excellent colleges, schools, and libraries. A state department of higher education unifies control of the state university at Eugene, the state agricultural college at Corvallis, and the teachers colleges at Monmouth, Ashland, and La Grande. Only Iowa has a lower illiteracy rate (one per cent).

A New State but Old in History

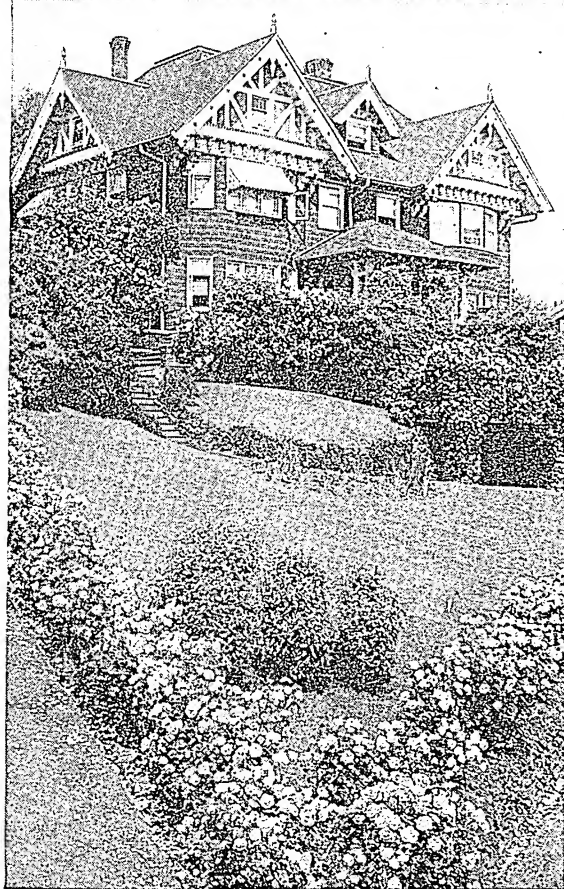
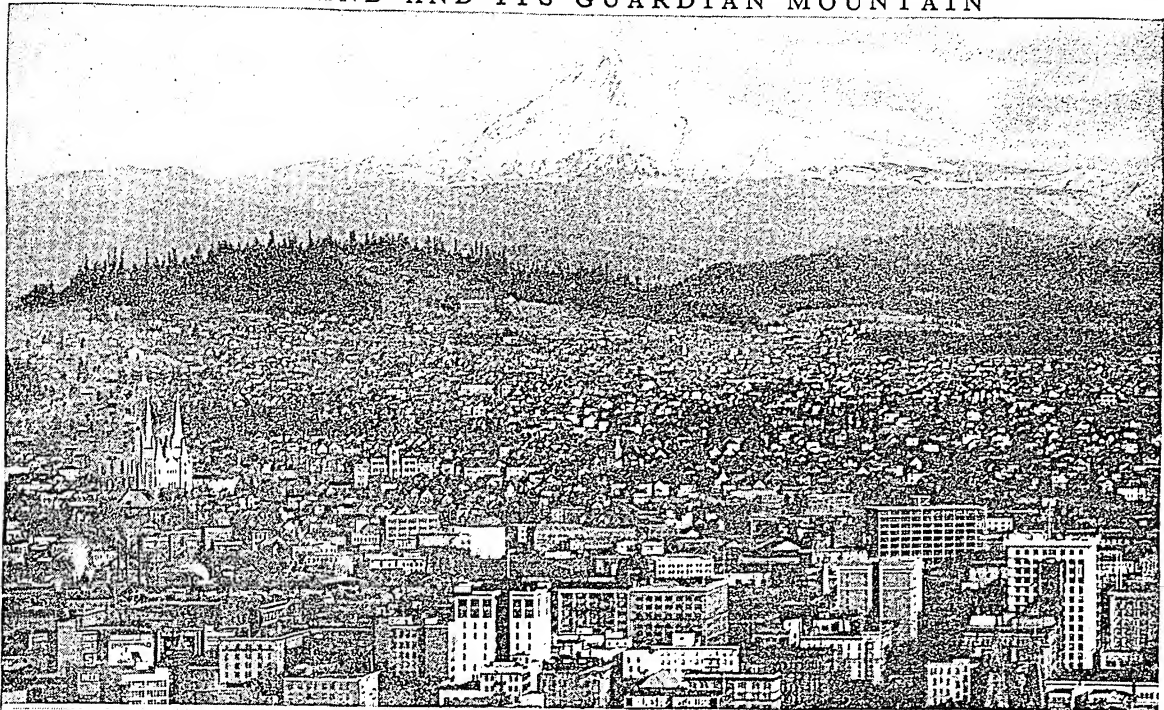
Old lore tells of the Spaniard Ferrelo, who in 1543 was the first white man to gaze on the coast of Oregon; of Juan de Fuca, who, just one century after the great adventure of Columbus, piloted his craft through

Puget Sound, where one blue strait still bears his name; of Martin Aquilar whose "rapid and abundant river," seen by him in 1602, may have been the Columbia; and of Bruno Heceta, who actually did discover the Columbia in 1775 and named it the Rio de San Roque.

But the star of Spain was setting. After the Spaniards came seaman after seaman, Russian, French, and British, seeking the Columbia, believed to be a "northwest passage" across the continent. But a curious sandbar sealed the mouth of the river to every foreign prow, even to that of the daring British discoverer Capt. James Cook, who sailed past the river's mouth on a stormy night; and to that of Capt. John Meares, another Briton who, daunted by the breakers at the entrance, named the inlet "Deception Bay" and the northern headland "Cape Disappointment," its present official name. Fate guarded the land for the United States, and in 1792, three centuries after Columbus, Capt. Robert Gray in the *Columbia* (or *Columbia Rediviva*), a Boston trading vessel, crossed the bar and sailed up the river, which he named the "Columbia" for his ship.

Their voyage, with the later explorations of Lewis and Clark and the tide of American settlement, was the basis for the United States' claim to the Oregon country. Without that region it would very likely have lost California, and without a Pacific coast the nation would have been a star of lesser magnitude, a prey to foreign intrigue.

PORTLAND AND ITS GUARDIAN MOUNTAIN



We are looking across the city of Portland at the imposing white-clad summit of Mount Hood. Few cities can boast such impressive surroundings. At the left is the type of dwelling common in the residence sections, set amid brilliant flowers and shrubbery.

The title to the Oregon country, however, was not secured without a struggle, for it was contested by both Russia, which then held Alaska, and Great Britain, whose fur-trading companies had early established posts in the region. In the War of 1812 John Jacob Astor's trading station at Fort Astoria, near the mouth of the Columbia, was captured by the British. In 1824 Russia agreed to limit her claims to the territory lying north of latitude $54^{\circ} 40'$; and in 1827 an earlier agreement was renewed with Great Britain for joint occupation of the whole coast south of the Russian line. Not until 1846, after a loud popular campaign for "Fifty-four forty or fight," did American and British statesmen arrive at the sensible conclusion to settle the "Oregon question" by dividing Oregon country, on the line of the 49th parallel, which already separated the possessions of the two countries east of these mountains. In 1848 the American Oregon Territory (including what is now embraced in the states of Oregon, Washington, Idaho, and parts of Wyoming and Montana) was formed, and in 1859 Oregon was admitted to the Union as a state with its present boundaries.

In the early period of Oregon history the Hudson's Bay Company played a prominent part, and there is no more picturesque scene than that of old Fort Vancouver (now Vancouver, Wash.), where Dr. John McLoughlin, Scotch Canadian, held sway for that company from 1823 to 1844. Irascible, dominating,

with a fierce brush of shining white hair, the "Father of Oregon" reigned like a prince in his fortress, with palisade, watch towers, and constant sentinels. This same post was the great market for the western fur trade. Most important of all, Dr. McLoughlin extended hearty welcome to all settlers.

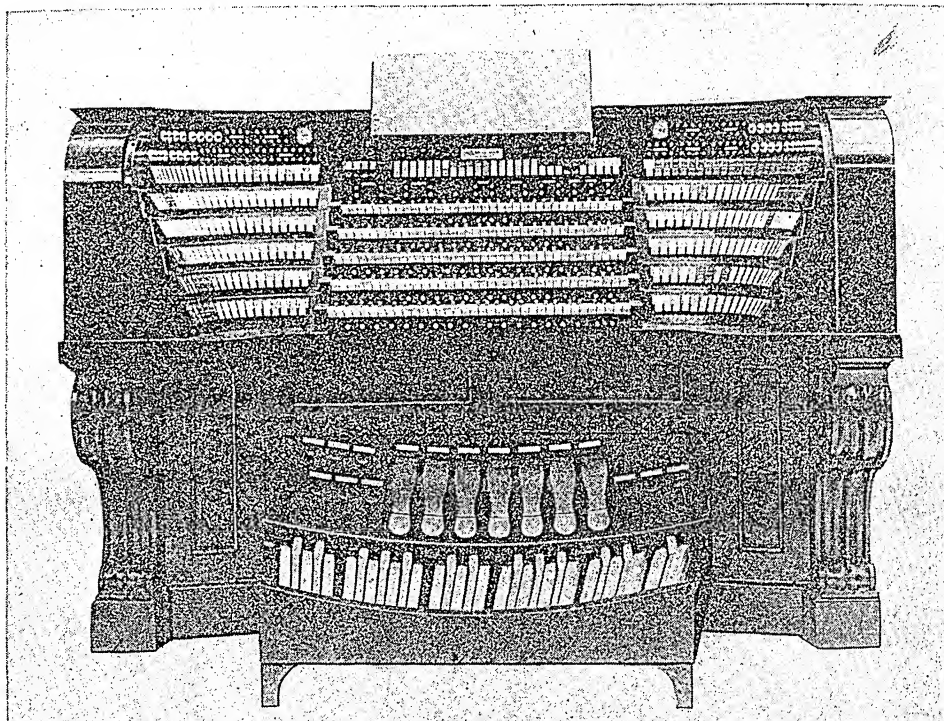
When four Flathead Indians from Oregon reached St. Louis in 1832, asking for the white man's "Book of Heaven"—the Bible—and Jason Lee and Dr. Marcus Whitman, with other missionaries, were dispatched to Oregon, it was Dr. McLoughlin who helped them settle in the Willamette valley. When Whitman returned east and started an immigrant train to Oregon in 1843, which was trapped by cold and hunger in the Cascade Mountains, it was Dr. McLoughlin who rescued and succored the nine hundred famishing travelers. And when the Hudson's Bay Company demanded of the great-hearted doctor on what authority he was extending aid to American immigrants, he replied curtly that the laws of humanity would always suffice him in such an emergency. The upshot was that he resigned his post, was naturalized an American, and went to Oregon City, where his ashes now lie, high on a bank over the shining Willamette.

The gold fever of 1849 swept Oregon, and opened up her mines in the hills of the Rogue and the Umpqua, around Baker City, and in the hills of the Willamette valley and on the Santiam—where, in the brittle quartz, are still found pockets of arborescent gold, in filaments and sticks, often like a bird's nest of spun gold. And on the heels of the miners came Indian wars, with the names of Chief Kamiakin and Chief Joe written in the blood of the fighting pioneers. They lasted until the Modocs' surrender in 1873. When the Civil War came, there rode to the defense of the flag from Oregon Gen. Joe Hooker and Gen. Philip Sheridan, of the famous Winchester ride.

Oregon's pathway since has been one of peace. But its smoother stages are due to the men and women of the earlier woodland trails, to those who "must blaze a nation's way with hatchet and with brand."

ORGAN. When you look at the keys of a pipe organ you see only a very small part of the organ itself, for it is the largest of all musical instruments. Sometimes above the keys of some organs you see rows of pipes that make the tones, but more often the organ is built as a part of the building, like a separate room, and the pipes, along with the rest of the machinery, are hidden behind the walls.

ONE OF THE LARGEST ORGANS IN THE WORLD

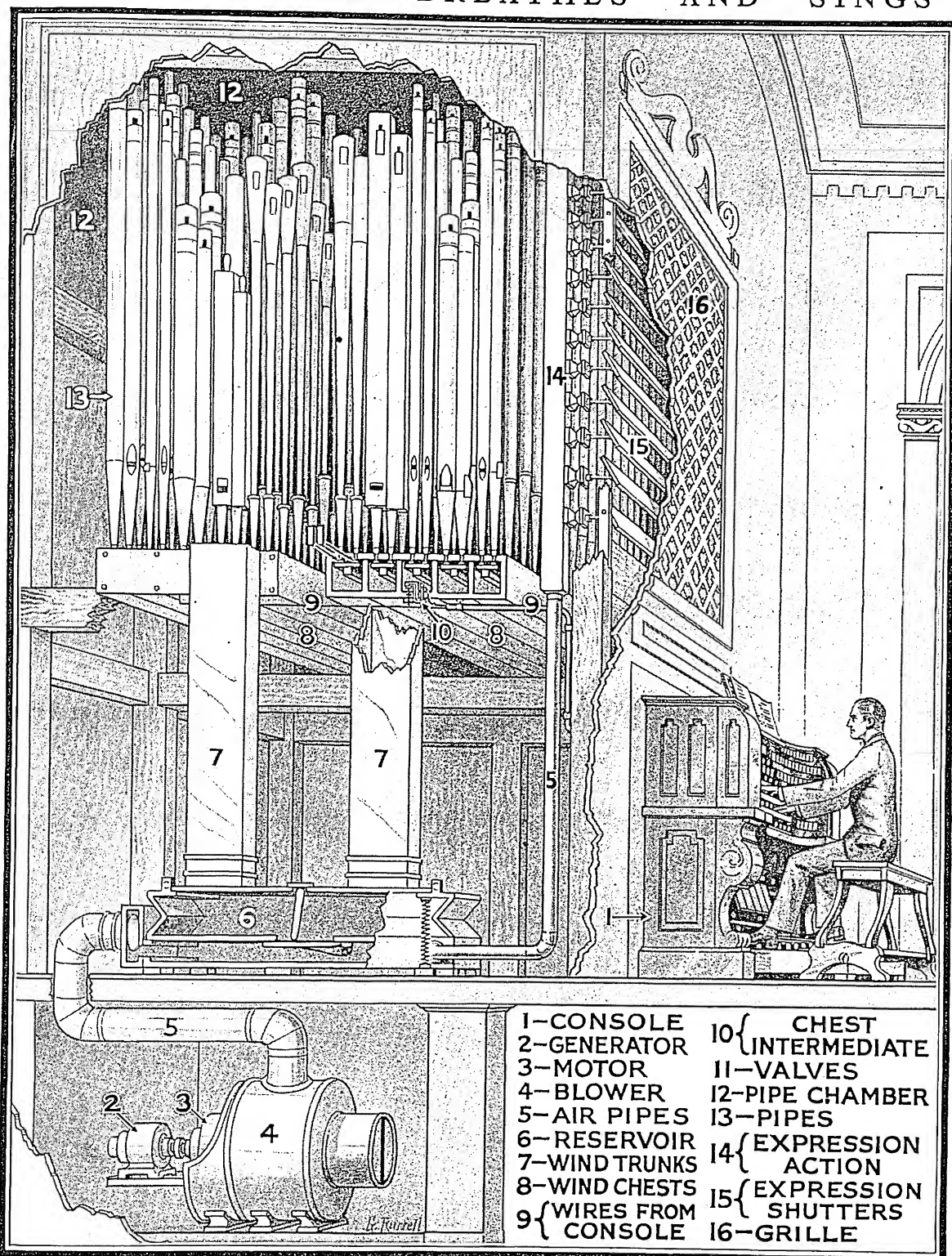


This organ has no fewer than 18,000 pipes and 232 stops. Imagine the difficulty of playing such an instrument, requiring the ability to do so many things at once with hands and feet! The entire organ, pipes and all, weighs 375,000 pounds; the heaviest single pipe weighs 1,735 pounds, and is 32 feet long. The longest pipe is 37 feet 9 inches long and 17 inches in diameter. The smallest pipe is three-fourths of an inch long and weighs about half an ounce. This musical giant, which stands in a Philadelphia department store, is really made up of eight "organs": great, choir, swell, solo, echo, chorus, ethereal, and pedal. In addition it has a piano, two sets of chimes, one set of gongs and a harp, all controlled by this one set of keyboards and stops.

There are hundreds and sometimes thousands of pipes. Some are as large as the trunks of full-grown trees; these make the deep heavy tones. Some are smaller than a lead pencil; these make the higher tones. The pipes are arranged in groups. Each group is controlled by a stop which is placed in reach of the organist; as he wishes to use any particular group, he opens the proper stop and thus connects it with the keyboard. The air which causes the pipes to sound is forced into them from an air chamber into which it has been pumped by a great bellows, or in some organs by an electric fan.

Some organs have as many as five rows or banks of keys. Each row is called a manual because it

HOW THE ORGAN "BREATHES" AND "SINGS"



When the organist touches the keys of his console (1) an electric contact at the back of each key presses another contact, sending an electric current along a wire (9) to an electromagnet called the chest intermediate (10). Magnetized by the current, the chest intermediate lifts a metal disk, releasing some of the air pressure which holds a little valve (11) against the base of each pipe. As the valve drops, air from the wind chest (8) rushes up through the pipe, making it speak. A blower (4) driven by a motor (3), with a generator (2) if direct current is not available, forces compressed air through the air pipes (5), reservoir (6), and wind trunks (7) to the wind chests. Pedals on the console control a series of valves called the expression action (14). They open or close shutters (15) outside the pipe chamber (12), to reduce or increase the sound. An ornamental grill (16) masks the pipes and organ mechanism.

is played by the hands (from the Latin word *manus*, "hand"), and each manual is connected with a particular set of pipes. When a key is pressed down, a valve is moved which admits air to a certain pipe. The most important manual is called the "great" organ; the other keyboards control the "choir," "swell," and "solo" organs. If the organ has a fifth manual (very few organs have), it is for the "echo" organ. In the very largest instruments which have seven or eight organs, one or more of the manuals may control two organs. Besides manipulating the stops and the different manuals, the organist plays with his feet another keyboard, called the "pedal" organ. These keys are of wood and very large.

The oldest known organ-like instrument was the "Pan's pipes" of ancient Greece. Pipes of different lengths, bound into a set, were sounded by the player's breath. About 200 B.C. a device was invented to force air into the pipes by water power, and keys were used to open and close the pipes. This "hydraulic organ" was common among the Greeks and the Romans. Centuries later the bellows replaced water power as the source of air. A 10th-century organ in Winchester Cathedral, England, had a bellows so huge that 70 men were needed to pump it. Today from 25 to 40 horsepower may be used; but machinery does the work. Delicate electric controls open and close valves at a finger touch, and the resources of the organ have been increased until now, in the largest organs, the player has 18,000 pipes at his command.

In 1935 Laurens Hammond introduced a revolutionary organ which used electricity directly, without air, to produce tones. A master-drive turns 91 tone-wheels, one for each fundamental note. Each wheel bears high spots which pass an electromagnet and generate electrical impulses having the frequency of the note (*see Sound*). Separate controls add impulses for overtones as desired. The various currents then are amplified and operate a sounding diaphragm as in radio (*see Radio*). The overtone controls can be set to give the tone of an organ or of other instruments, or tones unlike those of any other instrument. The wheels are driven by a synchronous motor, like an electric clock, and cannot get out of tune.

Somewhat like the pipe organ is the harmonium, sometimes called the reed or cabinet organ, used in homes and small churches. Instead of

pipes it has a great number of freely vibrating "reeds," or thin strips of wood or metal of varying length and thickness, which produce the various tones. Air is provided by a bellows worked by the feet.

ORINOCO RIVER. "I know all the earth doth not yield the like confluence of streams and branches, the one crossing the other as many times, and all as fair and large and so like one to another as no man can tell which to take." So Sir Walter Raleigh described the huge delta of the Orinoco, which he visited on his search for El Dorado in 1595. His description is not far out of the way, for this fan-shaped delta, nearly as large as the island of Sicily, is traversed by more than 50 channels and escape from it would be almost impossible by any but an experienced pilot. Indians conceal themselves in the fringes of trackless forests, where the charm of foliage and flower is enhanced by the presence of countless birds of richest plumage and dazzling hue. Monkeys disport themselves among the branches, which are hung with rare orchids and other air-plants of countless variety, and "bush ropes" or *bejucos*, cross one another from tree to tree, forming a trelliswork that is almost impassable. The soil is even more fertile than that of the Nile Valley, and produces tropical fruits in endless profusion.

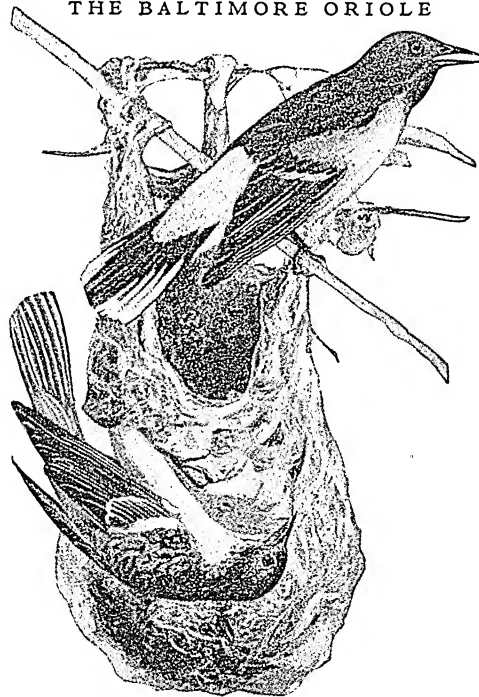
Above the delta, 120 miles from the sea, even in dry season the river is no less than 12 miles in width. Ciudad Bolivar, 260 miles from the sea, is the metropolis of the Orinoco basin and the center of the river trade. The land above the delta is mostly a vast treeless grassy plain—the *llanos*—where millions of

cattle, sheep, and horses feed. The source of the Orinoco was veiled in mystery until an American, Dr. Herbert S. Dickey, discovered it in 1931.

The Orinoco is one of the largest rivers in South America. It rises in the Sierra Parima range on the Brazil-Venezuela boundary and flows through central Venezuela to the Atlantic. Important among its hundreds of tributaries are the Guaviare, Meta, Apure, Arauca, Caura, and Caroni. It is about 1,600 miles long, and is navigable for large steamers for 700 miles, as far as the Cariben Rapids. The river usually overflows its banks, often for scores of miles, from May to January. (*See Venezuela.*)

ORIOLE. Orioles usually come to life in a tiny hanging nest on the tip of a high tree branch; but they are quite safe, for their little hammock

THE BALTIMORE ORIOLE



The male (above) is colored a brilliant fire orange and black, with considerable white on the wings. The female, clinging upside down to the nest below, is paler, and touched with olive.

is so strongly woven that, although made for one summer only, it will swing securely on its leafless bough even through the storms of winter.

Included with meadow-larks, blackbirds, and others of the *Icteridae* family are about 50 species of orioles, distributed throughout temperate and tropical America. They feed on fruit, insects, and the honey of flowers. The nesting habits are similar, though some nests are only semi-hanging. Orioles are not great singers, but all have sweet whistling calls. They breed north to Nova Scotia and Manitoba, but winter south through Texas and Central America. Though always richly colored, especially the male birds, they reach their highest development in the tropics.

The Baltimore oriole is the favorite of the species. The orchard oriole, about seven inches long, has rich plumage of burnt-orange and black, and a sweet song. It is of very shy disposition and more rare than the Baltimore. West of the Rocky Mountains Bullock's oriole replaces the Baltimore. It is about 8½ inches long, orange and black in color, and very social in disposition. (For illustration in colors see Birds.) Old World orioles, though similar in color and habit, belong to another genus, named *Oriolus*. The best known is the golden oriole, a beautiful singer, somewhat larger than the Baltimore oriole.

Scientific name of orchard oriole, *Icterus spurius*; of Bullock's oriole, *Icterus bullocki*; of Baltimore oriole, *Icterus galbula*; of golden oriole, *Oriolus galbula*.

ORION. A mighty hunter of Greek legend, Orion was noted for his beauty and gigantic size and strength. According to the best known story about him, Orion was loved by the goddess Artemis (Diana), whose hunter he became. Her brother Apollo was angered at this, and one day seeing Orion swimming he pointed out to Artemis a black object in the water and challenged her to hit it with her arrow. She shot at it, finding when too late that it was the head of her lover. After his death he was placed among the stars, where he appears with a lion's skin, girdle, sword, and club, followed by his hound. The constellation of Orion is one of the brightest in the northern heavens. The three bright stars across its center are called "Orion's belt."

ORKNEY ISLANDS, SCOTLAND. Like a fleet of ships sailing from Scotland up into the Arctic Ocean lie the 70 islands of the Orkneys, windy and treeless, but noted for their bold and rocky scenery. For centuries these islands were the scene of many stirring events and bloody battles, for they were a natural stopping place for the Vikings in their voyages to the southwest. Their long black ships with monstrous figure-heads visited their shores, carrying the bold warriors in their search for plunder and fame. The islands remained in the hands of the Northmen until 1468, when a needy king of Denmark pledged the Orkneys and Shetlands to James III of Scotland as security for his daughter's dowry. In default of payment they became Scottish territory, Denmark formally consenting to the transfer in 1590.

About half of the 70 islands are uninhabited. On the largest island, called Mainland, is Kirkwall, a town of about 4,000 inhabitants. Other islands worthy of mention are Westray, Sanday, Stronsay, and Hoy, the last alone being mountainous and noted for its beautiful scenery. The inhabitants are largely descendants of the Northmen. On their small farms they raise oats, turnips, barley, and potatoes, and tend their cattle, sheep, and poultry. Fishing is also a leading industry.

Scapa Flow, a large well-protected anchorage in the south of the group, was the chief naval base of the British Atlantic fleet in the World War of 1914-18 and again in the European war which began in September 1939. Here too the German fleet was interned after its surrender in 1918, and later sunk by its crews Kirkwall, which lies at its northern angle, was the western base from which the stupendous task of laying the great North Sea mine barrage was accomplished, chiefly by American vessels; and also the point from which, after the armistice, the no less important and hazardous task of sweeping up the mines was carried on. Area of the islands, 375 square miles; population, about 25,000.

ORLEANS (*ôr-lă-ăn'*), FRANCE. Many historic memories cling to this old French town, situated at the northernmost bend of the River Loire, about 200 miles from its mouth and 75 miles southwest of Paris. It is the site of the ancient town of *Genabum*, which Julius Caesar laid in ruins when the Gauls rose against him in 52 B.C. The Roman city which arose here was named *Aurelianum* (probably in honor of Marcus Aurelius), whence the name "Orleans." It was important under the Franks and their successors, and its university (founded in 1309) became renowned as a center of learning in mediaeval and Renaissance days.

In the military history of France, Orleans has figured prominently. It is especially famous for its siege by the English during the Hundred Years' War, when it was relieved by Joan of Arc, the Maid of Orleans (see Joan of Arc). In the religious wars it was a center of Huguenot resistance. The Germans took it after hard fighting in 1870. During the second World War it again fell into the hands of the Germans in 1940 after a destructive bombardment.

Modern Orleans has wide boulevards, squares, and river quays. Its varied manufactures include tobacco, blankets, hosiery, pins, wine, vinegar, agricultural implements, tools, machinery, and motor vehicles. It is also important as a railway center and a distributing point, but its chief interest is in its historical memorials and public buildings. These include a cathedral which dates from 1601, several museums, much curious old timber architecture, an equestrian statue of Joan, and the house in which she was lodged. Population, about 75,000.

ORPHEUS (*ôr'fē-ūs*). "The father of song," as he was called, was a legendary poet and musician of Greece. Presented with a lyre by the god Apollo and instructed by the Muses, Orpheus by his divine music not only

enchanted men and beasts, but even caused the trees to follow him. On his travels with the Argonauts, he stopped the rocks from crushing the ship.

When his wife Eurydice died, he followed her to the lower regions. He charmed Pluto (Hades) into allowing her to follow him back to earth, provided he did not look back at her on the way. But Orpheus had to

'ORPHEUS AND EURYDICE'



This famous picture by Watts depicting a scene from the ancient myth hangs in the Tate Gallery in London.

make sure that Eurydice was following. He looked back, and lost her forever. Grief-stricken, he scorned the women of Thrace, where he lived, and they tore him to pieces. His body was gathered up by the Muses and buried near Mount Olympus, and there a nightingale sings over his grave.

OSAKA (*ō' sā-kā*), JAPAN. After Tokyo, Osaka is the largest city of Japan; and in manufactures and trade it has no close rival. As the greatest industrial center of the Orient, with a population nearly equal to that of Chicago, it has been called "the Chicago of Japan." It is on the Mainland (Honshu), 265 miles by air southwest of Tokyo.

The city is built on both sides of the river Yodo, at the head of Osaka Bay, which opens into the Inland Sea. Behind it stretches the fertile Settsu Plain, which gives ample space for the city's prodigious modern expansion. Little rivers and canals, like those of Venice or Rotterdam, wind through the city, but they are more useful than beautiful. Though it has fewer foreigners than any other of Japan's great cities, it is one of the most Western in appearance, with wide streets and great modern office and factory buildings of steel and concrete.

Until recently, the city of Kobe, 20 miles west, was the main deep-water port for Osaka, because the harbor at Osaka was too shallow for any but small ships. Much of Osaka's trade therefore had to be transhipped. But now costly harbor improvements enable Osaka to receive ships up to 10,000 tons. Osaka specializes in exports, Kobe in imports. The two cities together handle about three-fifths of Japan's foreign trade.

Spinning and weaving of cotton goods constitute Osaka's chief industry, and its heavy industries have reached enormous proportions. It has great iron and steel plants and shipbuilding yards, and it manufac-

tures machinery and airplanes. It also makes metal and leather goods, glass, brushes, chemicals, matches, and pottery. It has extensive sugar refineries. Raw materials are mostly imported.

The city began about A.D. 300 when an imperial palace was built there, but its great commercial importance dates from 1583-98, when it was the capital. In the 17th century it became the "banker of Japan," and built up a large domestic trade. This was the foundation of the vast foreign trade that developed in the 19th and 20th centuries. Although it is a very old city, most of its buildings are modern. The reconstructed castle and the ancient Shinto and Buddhist temples are almost the only relics of the past (see picture J-191b). Population, about 3,000,000.

OSIRIS (*ō-sī' rīs*). The most popular of the gods in Egyptian mythology was Osiris, son of Seb (the earth) and Nût (the sky). He was esteemed as a wise and just king, and later became the god of the sun, of health, and of agriculture. His wicked brother Set (night), having induced him to enter a chest, closed it and cast it into the Nile. Isis, the wife of Osiris, discovered her husband's body, but Set got it again and cut it into pieces. These Isis gathered and buried, and Osiris became ruler of the dead in the lower world. His son Horus avenged his murder by conquering Set.

On earth Osiris took the form of the sacred bull Apis. From the combined name Osiris-Apis came the form "Serapis," and later Serapis was thought of as a separate god. Osiris is usually represented wrapped in mummy clothes and wearing a high crown (see Isis).

OSLO (*ōs' lō*), NORWAY. The capital and largest city of Norway stands at the head of Oslo Fjord, which cuts deep into the southeastern part of the country. It is also the chief seaport. Oslo was the name of the ancient city founded here on the east bank of the Aker River by King Harald Sigurdsson in 1048. When the city was burned, the Danish king Christian IV rebuilt it in 1624 on the west bank of the river and named it Christiania after himself. This city expanded to include what was left of the old Oslo, which became one of the many suburbs. On Jan. 1, 1925, the name Christiania was changed to Oslo. Much of the present city is comparatively modern.

As you approach Oslo by sea, you pass by many islands in the 80-miles' length of the fjord. Before you lies the great harbor. On a high promontory on the right is the old fortress of Akershus, built about 1300. On a hill to the northwest is the royal palace. Beautiful mountains almost encircle the city. Their pine forests are cool retreats in summer, and their snow-clad slopes are perfect for skiing in winter.

Among the many handsome public buildings are the University and the National Theater. Near the University are the Museum of Art and a historical museum. There are large shipyards, machine shops, and foundries. Other manufactures include paper, cotton and wool, tobacco, chemicals, hardware, and soap. Fish and lumber are among the principal exports. In 1940 Oslo was occupied by the Germans when they invaded Norway. Nearly one-tenth of all the people of Norway live in Oslo. Population, about 250,000.

OSTEOP'ATHY. This system of therapy was originated by Dr. Andrew Taylor Still (1828-1917), a physician of Kirksville, Mo. It is based on the belief that the body normally makes its own remedies, but that it cannot do so when the body machine is out of adjustment; for example, when spinal joints do not move normally and hence interfere with nerve currents and blood and lymph supplies. The fundamental treatment consists of mechanical adjustment and correct diet and habits. (See Medicine and Surgery.)

OSTRICH. By far the largest of living birds is the ostrich, a queer-looking creature of the African and Arabian deserts, whose chief glory is the beautiful feathers that spring from its wings and tail. A full-grown ostrich is seven, and sometimes eight, feet tall and weighs from 150 to 300 pounds. Its undeveloped wings are useless for flying, but its long, strong, thick legs carry it across the desert faster than the swiftest horses of Arabia can gallop. At full speed it covers 25 feet at a single stride.

The ancients called the ostrich the "camel-bird" with good reason, for it resembles the camel in a number of ways. It has a long curved neck and a very small head, which it carries erect, a humped back, only two padded toes on each foot, and an ungainly walk. Like the camel it eats the coarsest desert plants and adds stones or any other hard objects to its diet to help grind up the mass of roughage. The feathers covering the body of the male bird are a rich black; its wings and tail contain the pure white feathers so highly prized as plumes. The tail feathers are considered second in quality. The female's feathers, which are gray, are not so much in demand.

During the breeding season ostriches are seen in groups of one male and four or five females. At other times the birds seem to enjoy the society of antelopes and other animals. To impress his harem the male ostrich utters a loud "boom-boom," which has a terrifying sound. The birds lay their eggs, sometimes 40 or 50, in a common nest formed in the sand. At night the male sits on the eggs, and the females take turns through the day. The eggs hatch in 42 days. The brood rarely exceeds 20 in number, for many of the eggs are broken or taken by natives. Often, too, the male will toss out a few eggs if there are too many in the nest for comfort. Ostrich eggs are good food. One egg weighs three pounds or more and is equal to two or three dozen hen eggs.

The strong leg of the ostrich and its sharp-clawed foot are its defense against marauding animals or men. If molested it fights viciously, kicking sideways or forward so powerfully that men and animals have been killed by a blow.

Ostriches have been domesticated since the 1860's. When the plumes were at the height of their fashion, ostrich farming was a very lucrative industry. About 85 per cent of the world's supply of plumes comes from the highly bred birds of South Africa. North

Africa, Australia, and America supply the other 15 per cent. In the United States ostriches have been raised successfully in California, Arizona, and elsewhere. The best results are obtained by hatching the eggs in incubators. The newly hatched bird is the

THE EXPRESS TRAIN OF THE DESERT

Full-grown ostriches run considerable distances at a speed of about 30 miles an hour.



size of a full-grown hen and in six months is nearly the size of its parents. Feathers are clipped when the birds are only six months old, but the finest plumes come from birds two to thirty-five years old. Each wing gives about 30 feathers and the tail twice that many.

The closest relatives of the ostrich are the rhea of South America, distinguished by its three-toed foot, the emu, the cassowary, and the kiwi. In these birds the breast bone is not keeled, as it is in all other birds. The ostrich belongs to the family *Struthionidae*. Of the four living species, *Struthio camelus* of North Africa and Arabia is best known.

'OTHELLO'. At the heart of this Shakespearean play, coiled like a snake, is Iago, a knave of surpassing cunning. Believing himself injured by Othello, the great Moorish captain of Venice, Iago goes craftily to work to wreck the happiness of that free and open nature. He knows that all the joy of Othello's life is centered in the affection of his innocent young bride, Desdemona. It is here, therefore, that Iago strikes. With diabolic skill, "honest Iago" instills into Othello's mind, drop by drop, the poison of jealousy—hinting that Desdemona bestows her love on Othello's handsome lieutenant, and contriving to bring about situations that lend color to his slander. Maddened at length with suspicion and the anguish of wronged love, the Moor strangles his bride in her bed. Then, too late, he learns what villainy Iago has practised on him. He is seized with terrible remorse, and in agony slays himself, while Iago is led off to a well-

merited prison and torture. The play is one of Shakespeare's four supreme masterpieces in tragedy. It is Iago, hinting that Desdemona's good name stands endangered, who says—

Good name, in man or woman, dear my lord,
Is the immediate jewel of their souls:
Who steals my purse, steals trash; 'tis something, nothing:
'Twas mine, 'tis his, and has been slave to thousands;
But he that filches from me my good name
Robs me of that, which not enriches him,
And makes me poor indeed.

Poor Othello in his final speech asks only—

Speak of me as I am; nothing extenuate,
Nor set down aught in malice: then, must you speak
Of one that loved not wisely but too well;
Of one not easily jealous, but, being wrought,
Perplexed in the extreme; of one whose hand,
Like the base Indian, threw a pearl away
Richer than all his tribe; of one whose subdu'd eyes
Albeit unused to the melting mood,
Drops tears as fast as the Arabian trees
Their medicinable gum.

OTIS, JAMES (1725-1783). This early Revolutionary statesman and orator of Massachusetts, who ranks with Patrick Henry of Virginia, was graduated from Harvard University in 1743, and studied law in Boston until admitted to the bar in 1748. In 1760, while he was advocate-general of Massachusetts colony, the revenue officers of the crown asked his aid in obtaining general search warrants, known as "writs of assistance," by which they might enter any man's house in search of smuggled goods. Otis considered these writs illegal, and refused to uphold the government. He resigned instead and next year appeared in the case in behalf of the people. His five-hour speech on that occasion made a great impression, John Adams saying of it afterwards: "Otis was a flame of fire and carried all before him. American independence was then and there born." Unfortunately the only report we have of this great speech is one which Adams, then a young lawyer, wrote out from his notes.

From this time on, Otis was for some years increasingly active in the Revolutionary agitation. He was elected to the colonial legislature, and in 1765 he was sent as a delegate to the Stamp Act Congress in New York. Here he was a member of a committee that prepared an address to the English House of Commons. He wrote as well as spoke in defence of the colonies, 'The Rights of the British Colonies Asserted and Proved' (1764) being his best known pamphlet.

Unfortunately this great leader, who was called "the most able, manly, and commanding character of his age at the Boston bar," received a blow over the head from one of the British revenue officers in 1769, which led to recurring fits of insanity. Thus his able leadership was lost to the colonists before the armed conflict came. Although in an unbalanced mental condition, he took part in the battle of Bunker Hill. He was killed by a stroke of lightning in 1783.

OTTAWA, ONTARIO. A magnificent sweep of river-belted hills, fringed in brilliant green and crowned with lofty and dignified towers—such is one's first impres-

sion of the city of Ottawa, the capital of the Dominion of Canada, situated on the right bank of the Ottawa River near the eastern corner of the rich province of Ontario. A closer view reveals further beauties—picturesque tree-lined streets, parks, numerous fine bridges thrown over the rushing waters of the Rideau River, which flows into the Ottawa from the south, skirting the city to the south and east. And over all presides the group of impressive Gothic buildings on the summit of Parliament Hill, rising 150 feet sheer above the river level. Here the Canadian parliament sits, and near by are the executive offices of the Dominion government, where are administered the affairs of a country nearly as vast as all Europe.

1,000,000, Horse-Power from the Rivers

The Ottawa River, here 600 feet wide, after racing over a series of rapids, plunges downward in the Chaudiere Falls, a distance of 40 feet; and a little farther on a curtain of shimmering mist marks the spot where the Rideau pours over high rocks into the larger stream. Opposite and a little below the Rideau Falls, the Gatineau River flows into the Ottawa from the province of Quebec to the north.

Within a radius of ten miles, Ottawa has available a rush of waters capable of producing more than 1,000,000 horse-power. Much of this is already harnessed to the city's thriving industries. Below the city the Ottawa becomes navigable, forming a highway through the St. Lawrence to the sea. The Rideau Canal running southward connects Ottawa with the Great Lakes at Kingston; and the valleys of the upper Ottawa and the Gatineau lead to the city the products of the rich regions stretching away to the west and north.

The timber industry surpasses all others. Millions of feet of logs are floated down the Ottawa and Gatineau rivers every year, and are here turned into lumber, house furnishings, matches, fiber-ware, wood pulp, and paper. Meat packing, leather goods, brick and tile works, machine shops, railway car and repair shops, foundries, clothing factories, and cement works are other thriving industries. The Canadian Pacific, the Canadian National, and the New York Central railway lines meet here.

The Nearby City of Hull

Sharing the prosperity of Ottawa is the city of Hull, Quebec. It is reached by a fine steel bridge spanning Chaudiere Falls, and a much larger interprovincial bridge below the falls, which combines railway, electric cars, roadway and foot-passenger traffic. This city, which was almost destroyed by fire in 1900, has been rebuilt and now has a population of 29,433.

Besides the group of government buildings, which includes the excellent Library of Parliament, Ottawa has two cathedrals—one Church of England and the other Roman Catholic—the University of Ottawa (Roman Catholic), several colleges and technical schools, a museum and an art gallery with valuable collections. It is also the headquarters of the Royal Society of Canada.

Philemon Wright, a New Englander who settled on the north side of the river near the end of the 18th century, may be regarded as the founder of Ottawa. In 1826, Colonel By was sent from England to construct the Rideau Canal, and his engineers and workmen established the settlement of Bytown which formed the nucleus of the present city. In 1854 the town was incorporated and its name changed to Ottawa. Four years later Queen Victoria, unable to adjust the rival claims of Montreal, Quebec, and Toronto, selected Ottawa for the Canadian capital, and it remained the capital after the formation of the Dominion in 1867.

A mysterious fire during the World War in 1916 destroyed the main Parliament building, but reconstruction was soon begun and a much larger fireproof building, though of the same Gothic architectural plan, has replaced it (for picture, see Canada). Population, 126,872.

OTTER. If the land animals should hold a swimming and diving contest the otter would be a likely candidate for championship honors. He is so much at home in the water, diving, rising, and turning with lightning-like quickness, that he can beat the fish at their own game. In fact his food is chiefly fish.

This aquatic carnivorous animal is related to the weasel, but is much larger. It has been so much hunted for its fur, especially in America, that it is becoming very rare; but may still be found occasionally in various parts of the country from Alaska to Florida. It has an elongated body, about $2\frac{1}{2}$ feet

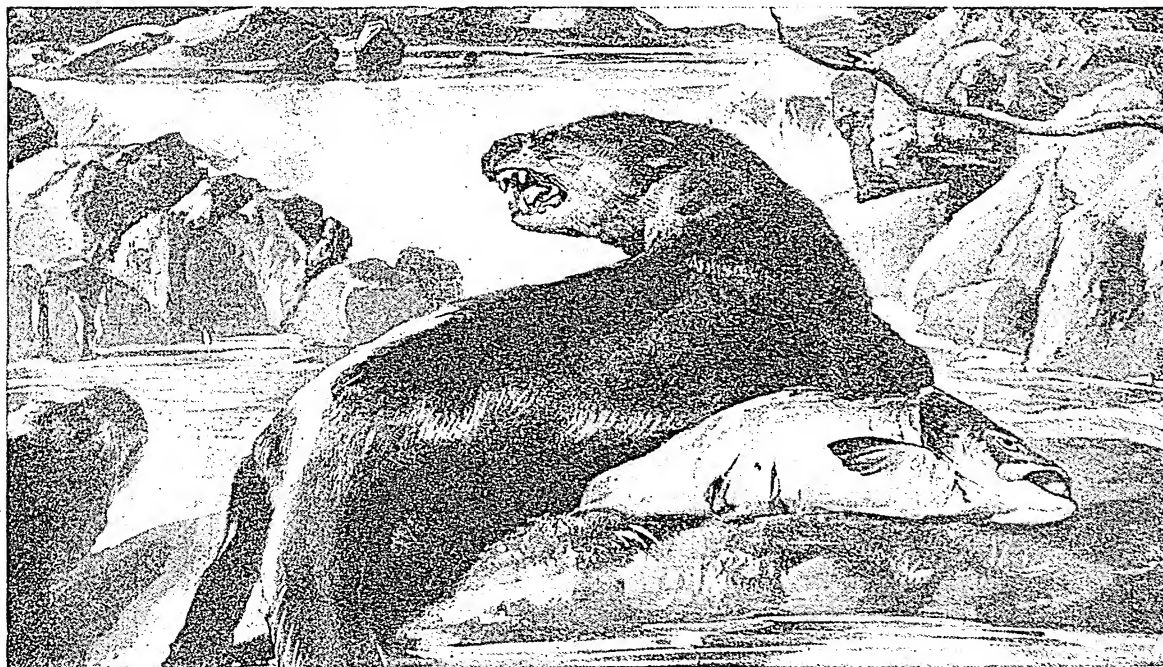
long (exclusive of the tail), with short limbs and webbed hind feet. It is seal-like in form and is covered with a thick coat of fine dark brown fur, brighter below than above. The common otter of Europe is similar in form to the American otter but shorter.

Otters are fond of sliding down slopes into the water; and in winter they slide on the snow and enjoy coasting as well as a schoolboy. Among themselves otters are playful and affectionate, and they have been tamed, making intelligent and useful pets. Some have been trained to answer their master's whistle. In certain parts of India and China tame otters are used to catch fish for their masters or to drive them into nets. They take excellent care of their offspring, which are usually from two to five in number. The dens generally have the entrance under the water. Sometimes a nest is found under a hollow tree, again in a cave.

The sea-otter, which is much larger and heavier, and brings forth but a single pup, is a related form that belongs to another genus. It is one of the most valuable of fur-bearing animals, and a single skin will bring over a thousand dollars. It was once abundant in the Pacific from California northward, but now is very rare, save about the Aleutian Islands where it is protected by law. It is about four feet long, and has fine dense lustrous fur, almost black, sprinkled with long white-tipped hairs.

Scientific name of common otter of the Old World, *Lutra vulgaris*; of North American otter, *Lutra canadensis*; of sea-otter, *Lutra lutris*.

THE CHAMPION SWIMMER OF THE LAND ANIMALS



Here the artist has shown an Otter with his captured prey, a salmon. It is said that when an Otter eats a fish, he holds his prey firmly between his paws, begins at the head, and eats down to the tail, which he leaves. His teeth are strong and very sharp. Because of the fishy flavor of his flesh and his aquatic habits, the Otter in medieval times was considered a fish. A full-grown Otter weighs about 25 pounds.

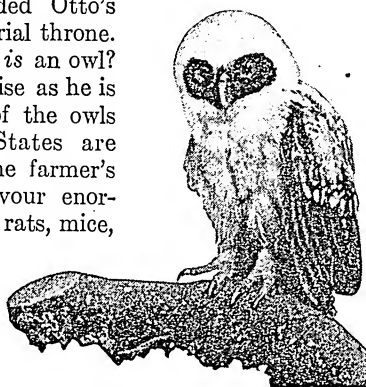
OTTO, EMPERORS OF THE HOLY ROMAN EMPIRE. Four emperors of the Holy Roman Empire bear the name of Otto or Otho. Otto I of the Saxon line ruled Germany from 936 to 973, and in 962 reestablished the empire of Charlemagne under the name of "the Holy Roman Empire of the German Nation." He is usually known as "the Great." He is described as having a powerful figure, a red face, a long wavy beard, and eyes that moved incessantly "as if they were watching their prey." His deeds show him to have been a man of energy, courage, and military skill. He strengthened the royal control over the unruly German dukes, conquered Italy in 952, and three years later won a great victory over the invading Hungarians (Magyars) at the battle of Lechfeld in Bavaria.

His son Otto II was emperor from 973 to 983. On the whole he maintained the gains of Otto I, but died in Rome, at the age of 28, while on an expedition to that rebellious country. He is buried in St. Peter's.

His son Otto III (983-1002) thus became German king when he was only three years old, and was crowned emperor by the pope at Rome when he was 16 (996). His mother was a learned Byzantine princess, and his tutor Gerbert (later Pope Sylvester II) was the greatest scholar of that day, especially in mathematics. The young emperor himself, however, was dreamy and impractical. With his death at Rome, at the age of 22, without children, the direct Saxon line came to an end.

Otto IV (1198-1214) was a member of the house of Welf (Guelf), was educated at the court of Richard I of England, and was put forth as a rival candidate against the Hohenstaufen Philip of Swabia. Although he gained the throne with the aid of Pope Innocent III, his course as emperor was so hostile to the church that the pope excommunicated him in favor of Frederick II. The battle of Bouvines (1214) in northern France, in which his ally John of England was defeated, ended Otto's hopes of the imperial throne.

OWL. How wise is an owl? Probably not so wise as he is useful, for most of the owls of the United States are counted among the farmer's friends. They devour enormous quantities of rats, mice, insects, and other enemies of crops. It is estimated that in some regions an owl is worth \$20 a year to a farmer.



Anybody can see why this one is called the Spectacled Owl.

THE BARRED OWL



The Barred Owl is one of the commonest sorts found in the United States. This is a young bird, before the feathers show many stripes.

Owls see but poorly in the daylight, so that all their hunting is done at night. In daylight they sit and blink, and their reputation for wisdom, as in the case of some humans, is probably due to their solemn silence. Their eyes are so adjusted in the eye sockets that they cannot move the eyeball but must turn their heads to focus from one point to another. Surrounding the eyes is a feathered disk that gives the effect of a mask over the face. The neck is short and thick, and the legs are set so far back on the body that the bird sits in an upright position. The plumage, which is generally gray or brown mottled with lighter shades, is very fluffy and gives an appearance of great size.

The owls' nests of various kinds are found in old buildings and in cavities of rocks and in trees; sometimes the birds repair the discarded nests of hawks or of squirrels. The eggs, in-

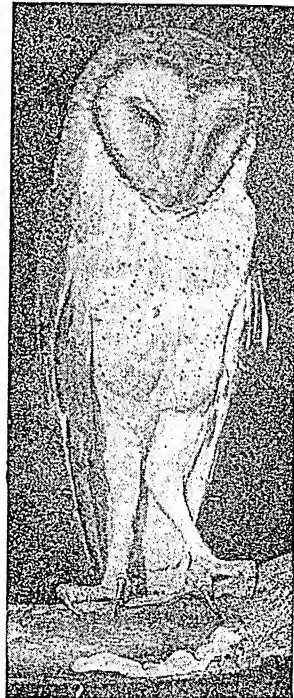
variably white, are from three to five in number.

Owls are found in all parts of the world. Because of a difference in structure the barn owls are placed in a separate family (*Tytonidae*). All other owls belong to the family *Strigidae*. The barn owl of the United States has buff and grayish upper parts mottled with black and white. Its heart-shaped facial disk and under parts vary from white to deep buff with the buff usually dotted with tiny black spots. It is especially valuable to man because it preys chiefly on rats and mice.

The long-eared owl, a woodland bird of temperate North America, has two conspicuous ear-like tufts of feathers on its head. It is 15 inches long, and has dark brown upper parts mottled with white.

The barred owl is the "who? whoo?" questioner so often connected with ghost stories. He lives along swamps and in dense forests, where the deep booming of his call might well discomfit even a strong-hearted night traveler. His plumage is handsomely striped and barred and his eyes stare as from behind immense tortoise-shell-rimmed spectacles. Some-

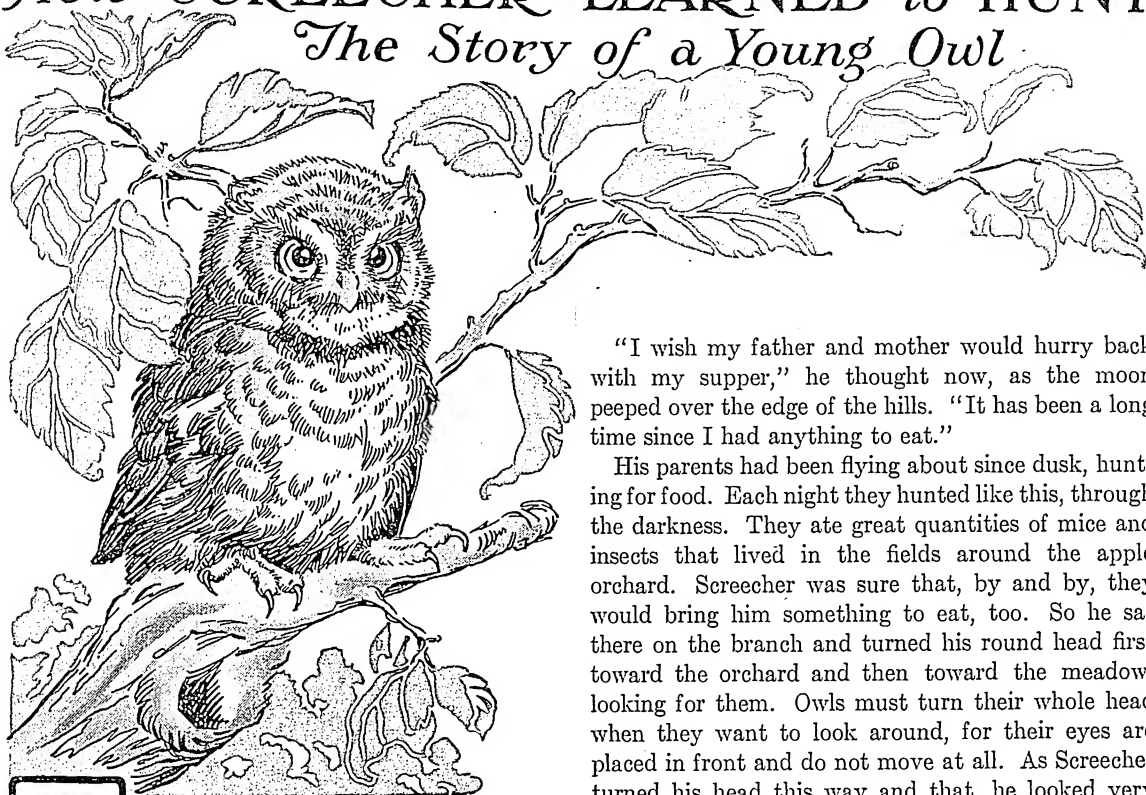
THE BARN OWL



This is the kind which makes its home in barns and thus has acquired its name.

How SCREECHER LEARNED to HUNT

The Story of a Young Owl



THE OLD apple orchard was very peaceful and quiet in the twilight. Most of the birds had gone to rest, and only an occasional sleepy note broke the evening stillness. On a branch of an apple tree at the edge of the orchard, Screecher, a downy young owl, sat blinking his great eyes. He was waiting for his parents to return with food for him.

Most of the day Screecher had been asleep in the family nest—a bare hole inside the apple tree. Like most owls, he slept in the daytime. Now that the sun had gone down, he was wide awake and very hungry for his supper.

He was lonely, too, because the three other little owls who had been hatched there in the family nest had already flown away. They had wanted Screecher to fly away with them, but he was not yet ready to go. It was pleasant to stay here in the old apple tree, sleeping through the day, and waking at evening to eat the beetles and bugs, or perhaps the fine fat field mouse, that his parents brought him. And it was pleasant to sit here in the darkness and listen to the cries of other owls, as they flew softly about in search of food. So, although the other little owls had made fun of him, young Screecher had stayed on in the old apple tree.

"I wish my father and mother would hurry back with my supper," he thought now, as the moon peeped over the edge of the hills. "It has been a long time since I had anything to eat."

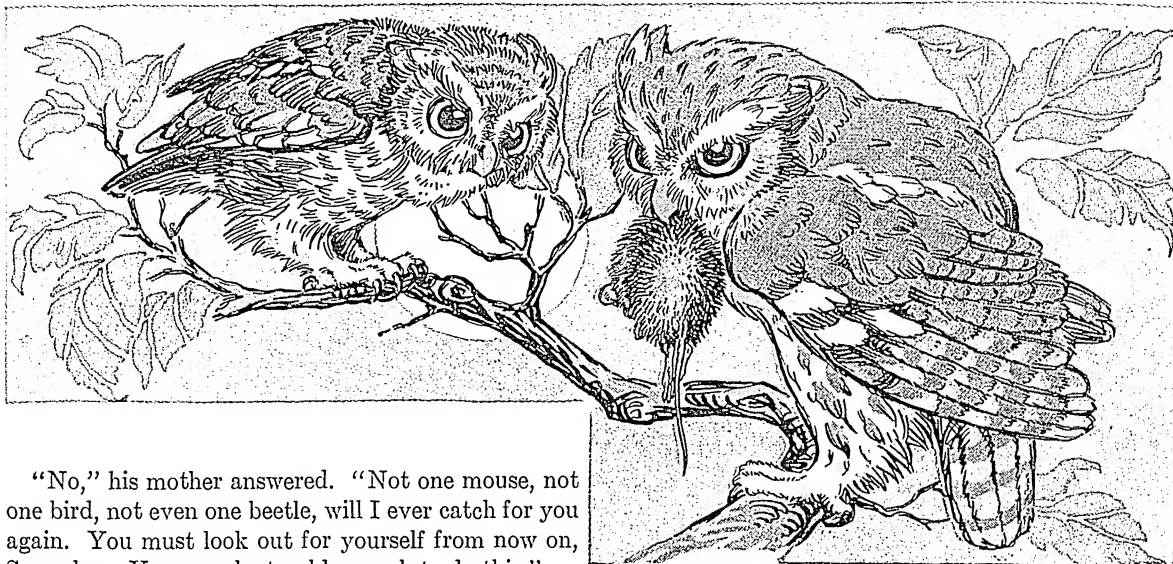
His parents had been flying about since dusk, hunting for food. Each night they hunted like this, through the darkness. They ate great quantities of mice and insects that lived in the fields around the apple orchard. Screecher was sure that, by and by, they would bring him something to eat, too. So he sat there on the branch and turned his round head first toward the orchard and then toward the meadow, looking for them. Owls must turn their whole head when they want to look around, for their eyes are placed in front and do not move at all. As Screecher turned his head this way and that, he looked very grave and solemn, and a little angry, too, for he was getting hungrier and hungrier.

Presently he saw his mother flying toward him, her wings moving slowly and silently. For a moment he watched her in admiration. He loved to watch his parents fly. The soft feathers on their wings were tipped with a downy fringe, so that they could move through the air without making any sound at all. And because they flew so silently, they could hear the little creatures moving about through the grass, and could pounce upon them so noiselessly that it made young Screecher very proud of them. He, too, would fly like this some day, he knew; and he hoped he would have fine reddish brown feathers, like his father's. Many screech owls are gray, and Screecher thought his father was much more splendid than the gray owls.

"What did you bring me for supper?" he asked eagerly, when his mother alighted on the branch beside him.

"Nothing," she told him. "Your father and I think it is high time you were learning to catch your own food."

"But I am so hungry, mother," Screecher complained in surprise. "Won't you please catch me something to eat?"



The father owl had pounced upon a field mouse

"No," his mother answered. "Not one mouse, not one bird, not even one beetle, will I ever catch for you again. You must look out for yourself from now on, Screecher. You are plenty old enough to do this."

"Oh, dear!" Screecher cried, in his high quavering voice. "Oh, dear! What shall I do?"

Just then his father alighted on the apple tree, and the young owl stopped his crying at once. "Father," he begged, "*you* will catch a mouse for me, won't you? You won't let me go hungry, I know."

"There is no need for you to go hungry, Screecher," the father owl said pleasantly. "There is plenty of food to be found on the ground. You have only to fly a little way to get all you want."

"Oh, father!" Again Screecher raised his voice. "I don't want to get my own supper! I want you to bring it to me. Pl—e—ase!"

The father owl did not wait for Screecher to say anything more, but flew softly to the ground. "Now," thought the young owl, "he will bring me my supper. I knew he would if I coaxed."

The father owl had pounced upon a field mouse and, holding it in his claws, he flew back to the branch beside Screecher. But to the young owl's dismay, his father at once began to eat the mouse.

"Oh, father!" Screecher cried sharply, "you are eating my mouse!"

"No," his father replied, "this is my mouse. I caught it, you know. If you want food, you must catch it for yourself now. You have good sharp ears, and if you will only listen, you will hear any number of small creatures moving about on the ground. They will make a fine meal for you."

Screecher was disappointed, but he obeyed his father and, sure enough, he heard something stirring in the grass. Without waiting a moment, he flew down and caught a fine fat beetle!

"There! That's right," said his father, when Screecher was once more beside him on the branch.

"A little later, you can practise catching mice. You will soon be able to do it as well as I do."

With this, the father owl gave his long quavering cry and flew away. The mother owl, with only a glance to see that Screecher was all right, flew after him.

"Well," thought Screecher, as he watched them go, "it is plain to be seen that if I want any more supper, I must catch it for myself." And then hearing another beetle he flew down and seized it.

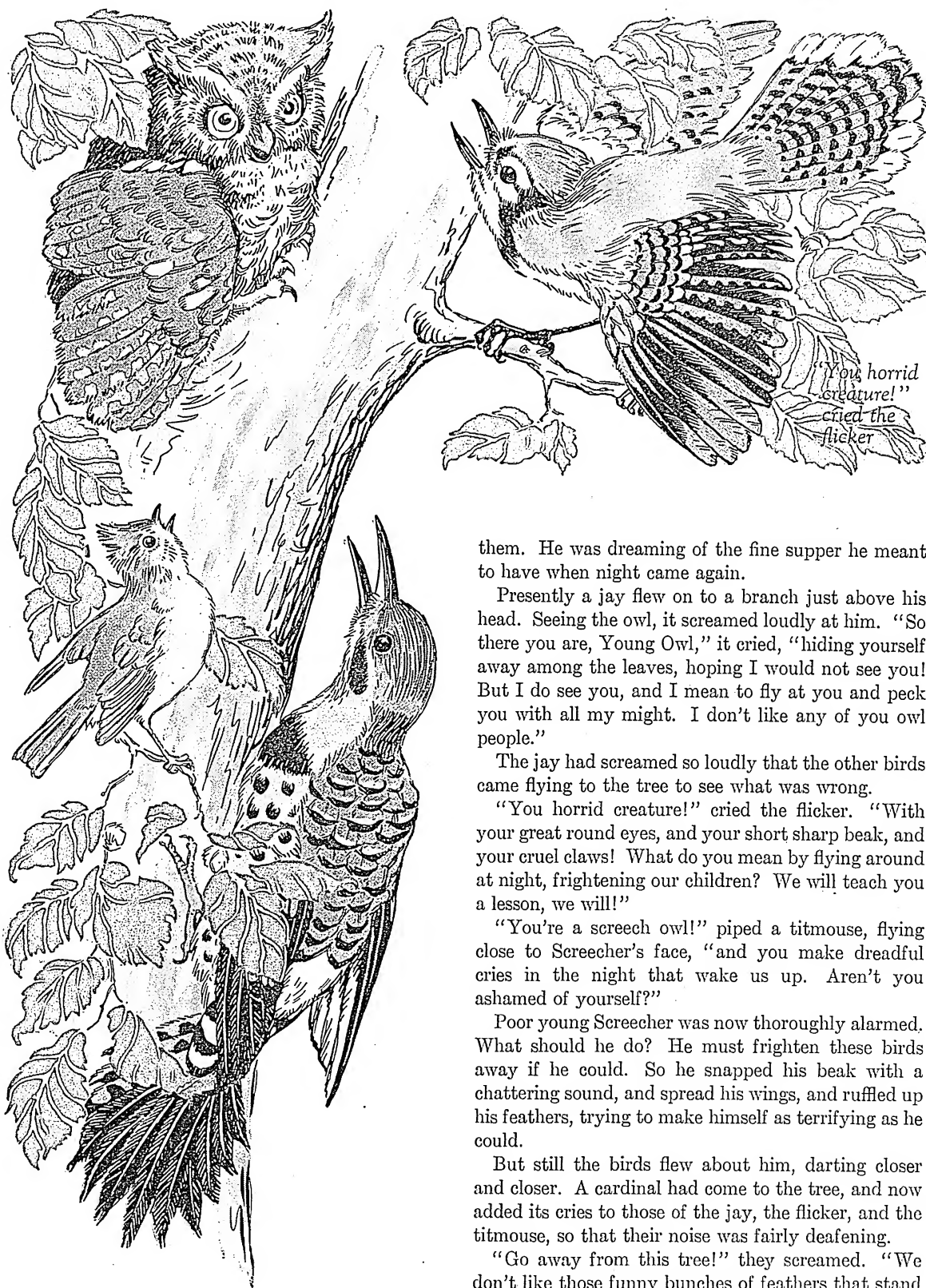
All night long he flew about, finding all kinds of dainties in the grass—earthworms, moths, spiders, and even an occasional snail. He ate so many of them that at last he could not eat another thing.

The east was now growing pale with the coming dawn. The young owl decided to go back to his nest and sleep until another night should come. But, as he looked about, he found that his own apple tree was nowhere to be seen. He had flown so far from home in his search for food that he could not find his way back! He was lost!

At first this frightened him, for the day was coming fast, and he did not see very well in the daylight. But after a moment, he wisely decided to seek shelter in the thick branches of a near-by tree. "I will wait here until darkness comes again," he thought, "and then I can find my way home."

When he was settled on a leafy branch, he turned his round head from side to side to look about and be sure that he was well hidden. Then he contentedly shut his eyes and went to sleep.

Higher and higher rose the sun. The birds sang gayly all around him, but Screecher did not hear



"You horrid creature!" cried the flicker

them. He was dreaming of the fine supper he meant to have when night came again.

Presently a jay flew on to a branch just above his head. Seeing the owl, it screamed loudly at him. "So there you are, Young Owl," it cried, "hiding yourself away among the leaves, hoping I would not see you! But I do see you, and I mean to fly at you and peck you with all my might. I don't like any of you owl people."

The jay had screamed so loudly that the other birds came flying to the tree to see what was wrong.

"You horrid creature!" cried the flicker. "With your great round eyes, and your short sharp beak, and your cruel claws! What do you mean by flying around at night, frightening our children? We will teach you a lesson, we will!"

"You're a screech owl!" piped a titmouse, flying close to Screecher's face, "and you make dreadful cries in the night that wake us up. Aren't you ashamed of yourself?"

Poor young Screecher was now thoroughly alarmed. What should he do? He must frighten these birds away if he could. So he snapped his beak with a chattering sound, and spread his wings, and ruffled up his feathers, trying to make himself as terrifying as he could.

But still the birds flew about him, darting closer and closer. A cardinal had come to the tree, and now added its cries to those of the jay, the flicker, and the titmouse, so that their noise was fairly deafening.

"Go away from this tree!" they screamed. "We don't like those funny bunches of feathers that stand

up on your head like horns. Why should you have horns, anyhow? We don't!"

"They are not horns!" Screecher answered angrily. "They are tufts of feathers that grow above my ears. And good sharp ears I have, too. I can hear better than any of you."

Screecher knew now that he could stay here no longer. So, without waiting another moment, he spread his wings and flew away. The birds screamed at him as he went, but the young owl landed safely in a tree a long way off and quickly hid himself in the heavy foliage.

For a long time he sat there, not daring to go to sleep. To add to his discomfort, he began to feel hungry once more. Ever since he had been hatched from a round white egg, Screecher had always had food in the daytime, for his parents had left worms and insects in the nest where he could find them when he woke up from time to time. Now there was no food for him unless he flew to the ground and caught it for himself. But screech owls do not hunt in the daytime, and he knew he must wait until the darkness came. So he closed his eyes and went to sleep again, and this time he slept in peace.

The twilight had come again when he woke, refreshed by his sleep. The other birds had gone to rest, and as he sat blinking his eyes and looking about he felt very contented and happy. It was fine, he thought, that he was now old enough to catch his own food, instead of having to wait for his parents to bring it to him. And as for the birds who had scolded him, he would take good care after this to hide himself where they could not find him. One of these days, when his feathers had grown a little longer, he would be able to fly about through the night without fear. He would be able to frighten his enemies and drive them away by flying at them, flapping his wings, and even pecking them with his strong curved beak, as he had often seen his parents do. Yes, it was a good thing to be a young owl who could go where he pleased and catch his own food.

Tightening his eight strong toes around the branch on which he sat, he looked down at the ground. Down there, somewhere in the grass, was all the food that he could eat; but, although he was hungry, he was in no hurry to begin his hunt. He had the whole long night before him.

An old screech owl flew silently past his tree. He could see its body outlined against the twilight—its

round head covered with soft brown feathers, out of which its two great eyes gleamed. He could see the soft brown feathers that covered its body thickly, and he watched with admiration as its wings rose and fell without a sound.

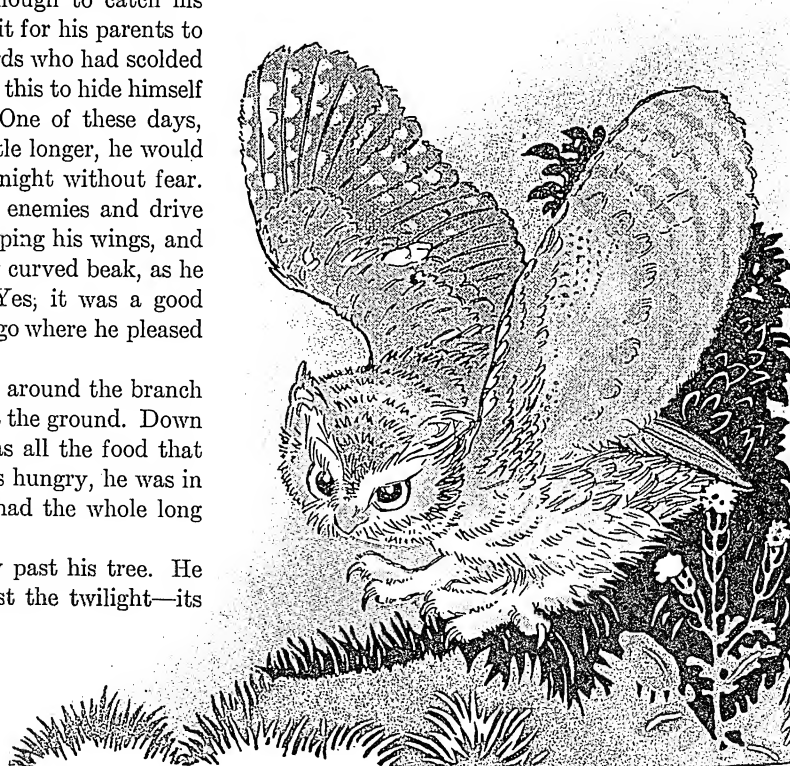
Another screech owl, farther off, sent up its long shivering cry. Perhaps it was his mother, Screecher thought, or his father; he did not know. And it did not matter much, for now the dark had come and owls were flying everywhere. He, too, would fly presently.

Again he looked down at the ground, listening intently. All of a sudden he swooped. Straight down he went, softly and surely. And in a moment, his claws had closed around a field mouse.

He had done it! He had caught a mouse! He was able now to look after himself, as his parents had said he must. How proud they would be!

Flying up to a low branch of the tree, he raised his voice in a long thin cry that rose and fell with a trembling sound. From not far away there came an answering cry, and Screecher knew that it was his father's voice.

"I will go right now," he thought, "and tell him about the mouse I caught!" And, spreading his wings, he flew happily away into the night.



*All of a sudden he swooped.
Straight down he went,
softly and surely*

In
no
life.
and
r

THE SCREECH OWL



This is a small bird, only nine to ten inches long.

times he eats small birds, but generally frogs, lizards, and mice are his diet. The burrowing owl, found on the western plains, inhabits holes dug usually by other animals. Their chief food is grasshoppers, but they eat lizards also.

The screech owl is responsible for the long, wailing, shivering night cry heard so generally throughout the middle and eastern parts of the United States. It is of this bird that the child Hiawatha speaks:

"What is that?" he cried in terror;
 "What is that," he said, "Nokomis?"
 And the good Nokomis answered:
 "That is but the owl and owlet,
 Talking in their native language,
 Talking, scolding at each other."

Screech owls, represented by many species and varieties, range over almost all of North America. They nest in trees, often in a deserted woodpecker's hole. In addition to mice they eat some small birds, but make up for this by destroying many cut-worms and caterpillars.

The great horned owl is called the "tiger of the air" for he is powerful and bloodthirsty, and the sweep of his great wings through the night air is as noiseless as the tread of the padded paws of the king of the jungle. He cannot be counted among the farmer's friends, for he is fond of domestic fowls and will repeatedly raid the farmyard. A single member of this group has been known to carry off 59 young guinea-fowl in one autumn. Rabbits are also a favorite food, and these are the only birds known to dine upon the skunk!

The snowy owl, with his white plumage, breeds in the cold regions of North America, but in the winter it travels south through the states, sometimes as far as Texas. Having grown up in the land of the midnight sun, he sees quite well in daylight and often secures his food while other owls are sleeping. On the wing he is so swift that he will overtake a grouse in flight.

The elf owl, no larger than an English sparrow, is found nesting in the giant cactus of southern Texas and Mexico. Its food is grasshoppers and beetles.

It is seldom seen in daytime. (For illustrations in colors of barn owl and screech owl see Birds.)

Primitive peoples have many superstitions about owls, most of which seem to arise from their peculiar cries. In the hoot of most owls the predominant sound is *oo, hoo, or ow*, giving it an unearthly quality. Some of the smaller owls have, nevertheless, a low and melodious note.

In many parts of Europe the hoot of an owl is regarded as a sign of death. On the other hand, its solemn, thoughtful air has caused its reputation for wisdom since ancient times, when it was the symbol of Athena, the Greek goddess of wisdom.

Every detail of the owl's body illustrates successful adaptation to night life. Even the hoot startles animals into betraying their location by rustling in leaves or grass. Any such rustle is detected instantly by the owl's sensitive ears. The ears have an external flap, which most birds lack; and in many species a funnel-like arrangement of feathers serves as an ear trumpet to aid hearing. The owl's eyeballs are elastic and long from front to back; so they can be focused sharply for near or distant vision. The pupil can be closed nearly tight by day and opened wide to make the most of night light.

Soft feathers make the owl's flight noiseless in approaching a victim (see Feathers). The outer claws can be turned in any direction; when the owl turns them backward in perching, it gets greatly increased strength of grip.

Owls form the order *Strigiformes*; they are close relatives of the nightjars. Scientific name of barn owl, *Tyto alba pratincola*; screech owl, *Otus asio*; great horned owl, *Bubo virginianus virginianus*; snowy owl, *Nyctea nyctea*; barred owl, *Strix varia*; long-eared owl, *Asio wilsonianus*.

THE SNOWY OWL



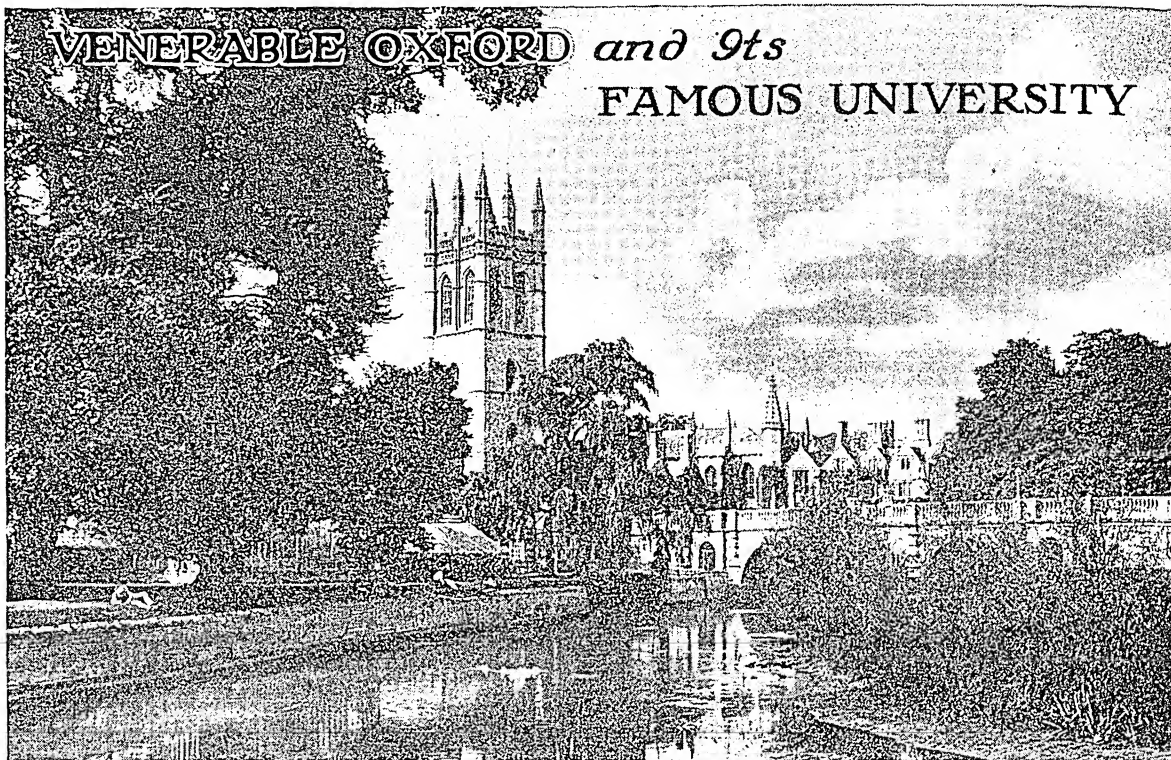
An inhabitant of northern regions, where his coloring blends with the snowy surroundings.

THE HORNED OWL



Also called the Eagle Owl. It is the largest and most powerful of the owl tribe.

VENERABLE OXFORD *and Its* FAMOUS UNIVERSITY



OXFORD, ENGLAND. Cupped in the purple hollow of softly swelling hills, held in the embrace of the stripling Thames and its lovely tributary the Cherwell, this famous English city is wrapped in a haze of romance and beauty. For nearly a thousand years its gray spires and towers have looked down upon an unbroken procession of great men and great events. To its venerable colleges have come England's youthful statesmen, poets, and philosophers to be nurtured in the traditions of beauty and sweetness.

Within the crumbling fronts of the Oxford colleges lived and labored the philosopher Locke and the historian Gibbon, the essayists Steele and Addison, the encyclopedic Dr. Samuel Johnson, and the reformer John Wesley. Shelley, De Quincey, and Ruskin, Newman, and Matthew Arnold have paced their moldering cloisters. Shakespeare must have slept in the quaint inns of the city as he journeyed from Stratford to London. Here Sir Robert Peel and Gladstone laid the foundations for their eminence as statesmen by taking "double firsts"—the rarest and most coveted scholastic honor that can be won at the university. Here, in the 19th century alone, ten prime ministers of Great Britain spent their student days. To mention all the illustrious men whose names are linked with Oxford would be to call the long and glorious roll of English history and English letters.

The origin of Oxford is lost in the mists of antiquity. It first rises from the haze in 737, when St. Frideswide founded her nunnery on the site of Christ Church

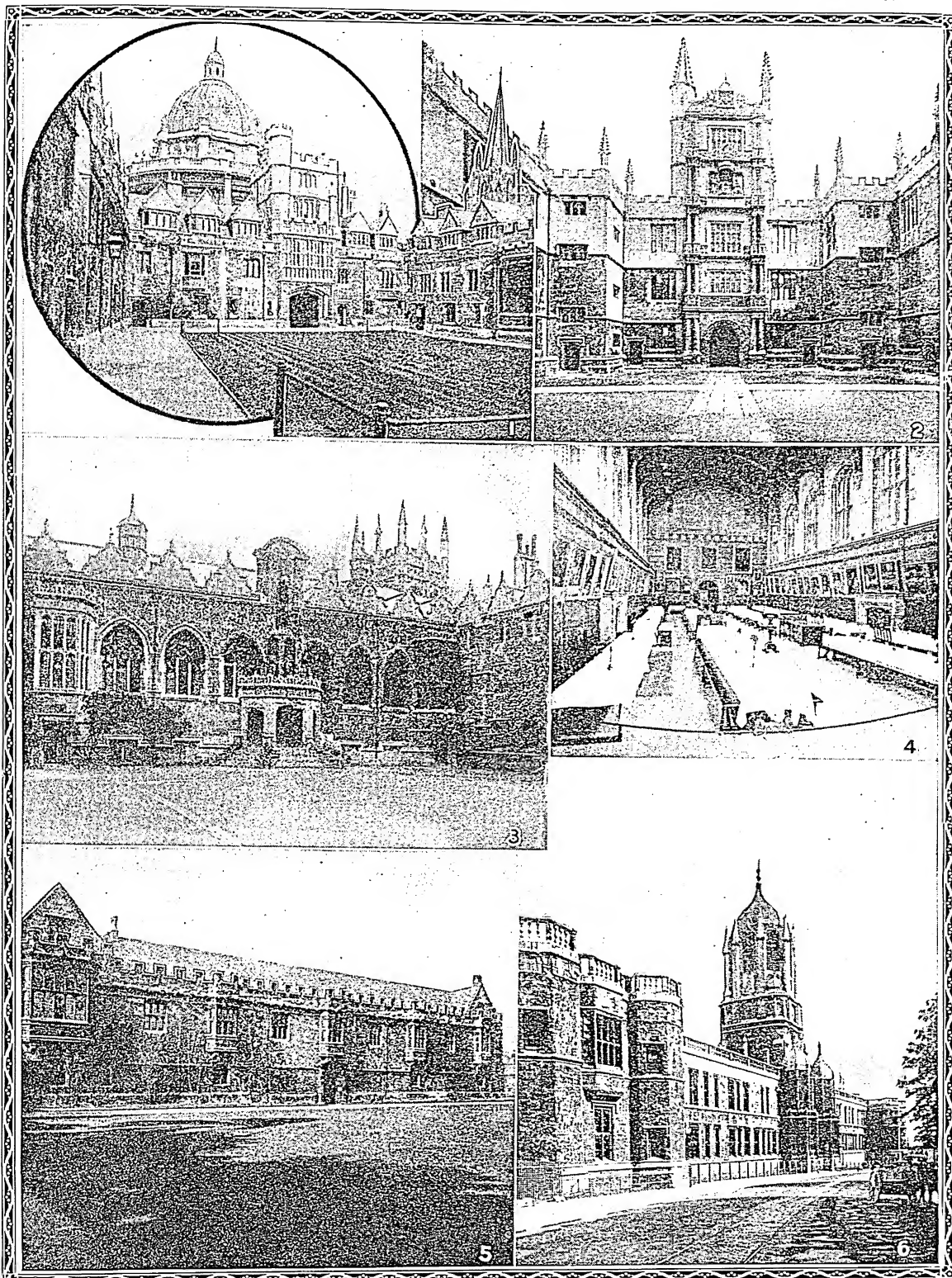
College. A thriving market town soon sprang up, which was burned by the Danes in 1009. The oldest known architectural remains are the tower of St. Martin's Church (1034) and the castle tower (1071). In this tower Empress Matilda, daughter of Henry I, was besieged by Stephen of Blois in 1135, and escaped by fleeing over the frozen snow-covered river, clad in white to prevent detection.

Legend attributes the founding of the University of Oxford to Alfred the Great, but the first discoverable traces of organized teaching in the city are about 200 years later, in the 12th century. Hither soon swarmed students from all over the world, and by the end of the century it had an academic population of 3,000. There were as yet no university buildings, no laboratories, no endowments. "Masters" gave instruction—all in Latin—to such students as chose to attend their lectures, and their entire income came from fees collected from their pupils. They were turbulent fellows, these medieval students, and enlivened their scholastic routine by frequent bloody affrays with the townsmen, so that the "town and gown" riots of Oxford became proverbial.

The friars began building monastic establishments in the 13th century. They flocked to Oxford in such numbers that they soon aspired to the control of the university. This caused ceaseless strife between the religious orders and the ancient colleges, which was only ended when Henry VIII dissolved the orders.

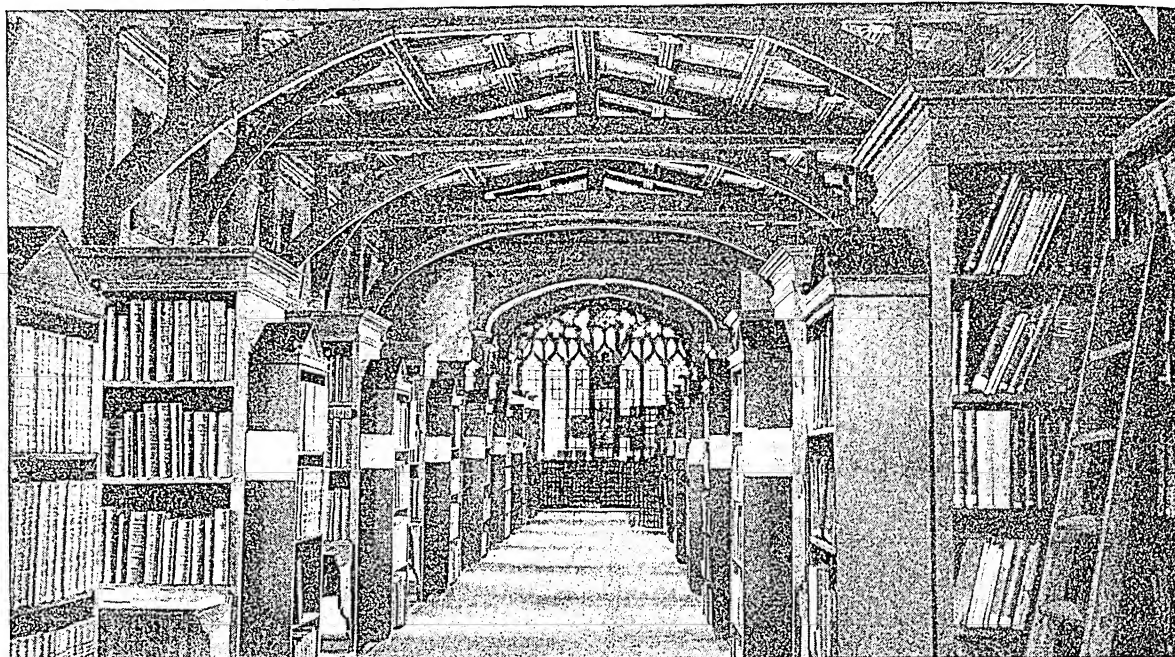
During the civil wars of the 17th century, Oxford became the seat of Charles I and the Royalist court,

ARCHITECTURAL BEAUTIES OF OXFORD



Two great churchmen, Cardinal Wolsey in the 16th century and Archbishop Laud in the 17th, left an indelible impress on the University. Wolsey founded Christ Church College, whose dining hall (4) contains a portrait gallery of famous alumni. The Tom Gate and Tower (6) form the main entrance to this college. Laud was an alumnus and fellow of St. John's (5), and became chancellor of the University in 1629, just one century after the fall of Wolsey. The other buildings shown are Brasenose College (1), the Bodleian Library (2) and Oriel College (3).

IN THE FAMOUS OLD BODLEIAN LIBRARY



This is one of the corners of the University which maintains a truly 17th century aspect. The library was founded in 1602, and is particularly rich in early editions of Greek and Latin classics and in books printed by Caxton and other early English printers. In one of the alcoves are a number of books, bound in heavy oak boards and fastened by iron chains to the bookcases, just as they have been fastened for hundreds of years.

while Parliament held forth at Westminster. Several important battles of the period were fought near by.

In organization, methods, and spirit, Oxford University is strikingly different from American universities. It is made up of 21 separate colleges, each with its own history, its own income, its own regulations, and its own characteristic organization. The colleges are federated into the university much as the states are federated into the United States.

The colleges with the dates of their founding are:

University.....	1249	Brasenose.....	1509
Merton.....	1264	Corpus Christi.....	1516
Balliol.....	1266	Christ Church.....	1525
Exeter.....	1314 and 1566	Trinity.....	1555
Oriel.....	1326	St. John's.....	1555
Queen's.....	1340	Jesus.....	1571
New.....	1379	Wadham.....	1613
Lincoln.....	1427	Pembroke.....	1624
All Souls'.....	1437	Worcester.....	1714
St. Mary Magdalen (pronounced <i>Maudlin</i>)....	1474	Keble.....	1868
		Hertford.....	1874

The university is an independent self-governing corporation, with its own police and its own courts. Its main functions are holding examinations, conferring degrees, and caring for the discipline of students when outside the walls of their own colleges.

Within the massive semi-monastic buildings of the colleges—each grouped around its own quadrangle of velvety lawn—the students live a life adorned by many curious survivals from medieval days. On all academic occasions, such as lectures, conferences with tutors, chapel, dinners “in hall,” the undergraduate must wear his quaint short gown and his “mortarboard” cap. He must be within the walls

of his own college before midnight, and he is required to pay a small fine if he comes in after the great college gates are closed at nine o'clock.

Members of the university are in residence only half the year. Most of the real reading for the degree is done during the six months of vacation. Lectures, essay writing, conferences with tutors, and reading take up from four to six hours of the average man's daily schedule during the term time. The rest of the day is given over to social life and athletics, which play a far more important part at Oxford and Cambridge than elsewhere. Every man is expected to spend his afternoons in some form of outdoor sport. There are teams enough in all the colleges so that everyone has a chance to play the game he likes best.

Rowing is by far the most popular of all sports at Oxford, and a large proportion of the students spend their afternoons on the river the academic year 'round. Besides the university “eight,” each college has its own crew. The “bumping” races between the college eights every spring and the Oxford-Cambridge races in the summer have for generations been among the most famous sporting events of the world.

The college tutor is the most important cog in the Oxford educational machine. He comes into personal contact with the student to a degree unknown in the universities of other countries. Every undergraduate is under the direction of one or more of these tutors, who lays out the course of study, advises in the selection of lectures, and holds weekly or semi-weekly conferences with the student, for which the latter is usually required to prepare an essay.

ONE OF THE MOST FAMOUS STREETS IN THE WORLD



This is the street affectionately called by Oxford students "The High." Fronting both sides of its half-mile curve are noble buildings, many, like University College on the left, strongly suggestive of medieval castles. First on the right is Queen's, surmounted by a statue of Queen Caroline, the wife of George II. Farther down on the right is another castle-like structure, All Soul's College, and back of it rises the spire of St. Mary's, the University church.

Through the Rhodes scholarships Americans and Canadians, and other British colonials have been brought to this famous old university in far greater numbers than formerly (*see Rhodes, Cecil John*). Every year sees a new group of students come from foreign colleges to enjoy the unique privileges which Oxford offers—its finely tempered combination of ancient buildings and modern learning, its traditions of sound scholarship and keen sportsmanship, the close association with fellow students and teachers resulting from the college and tutorial systems, and its unsurpassed beauties of scenery and architecture.

OXYGEN. What do you suppose is the most abundant substance in the world and the most widely distributed? It is oxygen, which exists as an uncombined gas in the air we breathe, and in combination with other chemical elements forms water, sand, limestone and other rocks, iron rust, sugar, cloth, paper, and so on. About half the weight of limestone, bricks, and such materials is oxygen, and eighty-nine hundredths of water is the same substance. As free oxygen it makes up one-fifth by bulk of the whole atmosphere.

In its free state oxygen is a gas without color, odor, or taste. Oxygen, however, is very active chemically, and readily enters into combination with nearly all other elements. Sometimes heat promotes

this chemical union, and sometimes moisture, as in the rusting of a knife blade. When wood burns it is a case of the oxygen of the air uniting rapidly with the carbon and hydrogen of the wood; for chemically "fire" is only the *rapid* oxidation of a substance. When oxygen thus unites in combustion with carbon, carbon dioxide, which also is an invisible gas, is formed. When oxygen unites in combustion with hydrogen, water is formed. It is easy to prove this, for if a piece of cold chinaware is passed swiftly over a flame of any sort (such as a gas flame) moisture will be condensed on it. This is an experiment which any child can easily try for himself. From the smoke-stack of a locomotive comes what you may call black smoke and white smoke. The black smoke is composed of fine particles of carbon which have not burned up; the white is a cloud of condensed water vapor, which soon evaporates into the air. The ashes of wood and coal are the parts which would not burn, or which when burned did not become gases.

Oxygen is necessary for all animal life. Nitrogen is necessary, too, but oxygen has a different use. It may be hard to believe that our bodies are being "burned" all the time, but this is a fact. The body tissues contain carbon and hydrogen compounds just as in wood and coal, and these are constantly being "oxidized," or combined with the oxygen in the air we breathe. In the case of our bodies the "burning"

is a *slow* combustion, but it also produces heat, which keeps us warm. If you work or exercise violently you become warmer, owing to the faster oxidation. The same chemical products are formed as in the case of the oxidation of the wood—namely, carbon dioxide and water. Breathe on a cold mirror and you will see the water vapor condensed on it.

Fishes make use of the free oxygen which is dissolved in water. This is the reason water for goldfish has to be changed, and why air is kept bubbling through tanks in aquariums where it is inconvenient to change the water. There is not so much free oxygen in water as in the air, and as a result the temperature of fishes' bodies is lower than ours. In sunlight green plants take carbon dioxide from the air, use up the carbon, and return the oxygen (see Carbon Dioxide and Monoxide).

Oxygen was discovered in 1774 by Priestley, an English chemist. Soon after this, Lavoisier, a French chemist, proved that oxygen is abundant in air. He also found that it combines with metals to form rusts, or oxides, and showed the part it plays in combustion.

The Oxygen Atom

Atoms of free oxygen usually combine by twos to form molecules (O_2). Three atoms may unite to form the allotrope *ozone* (O_3). This can be made by passing electric sparks through ordinary oxygen. In nature it is formed at high altitudes, in part, at least, by lightning. It has a peculiar smell, is a powerful enough oxidizing agent to attack rubber and cork, and is used as a germicide.

The oxygen atom exists in three forms, or *isotopes*; the atomic weights are 16, 17, and 18 (see Chemistry). This fact conflicts with the usual practise of giving the atomic weight of ordinary oxygen, which contains all three isotopes, as 16; but the error caused by ignoring the heavier isotopes, or *heavy oxygens*, is only 2 parts in 10,000, since the isotope with weight 16 is overwhelmingly the most common one.

The APPETIZING OYSTER and Its TROUBLED CAREER

OYSTER. Huge heaps of oyster shells found near prehistoric settlements along the coasts of Europe and America show that the oyster has always been a favorite human food. It still pleases the palates of more people than any other sea product, and ranks second only to the herring in commercial importance. The shells are valuable too. They are pulverized for chicken feed and fertilizer, and burned to make quicklime (see Shell).

Though the oyster appears to be a formless morsel as it comes to the table, it is in reality a complex creature, with mouth, gills, stomach, liver, intestine, and heart encased in its protective shell.

Oysters live along the shores of temperate and tropical oceans and seas. The supply in the North Atlantic exceeds that of all other waters combined. In Europe oysters are found from Norway to the eastern Mediterranean and the Black Sea. In the United States oyster beds are scattered along the coast from Cape Cod to the Rio Grande and from Puget Sound to San Francisco. The oyster catch is among the most valuable in the American fishing industry. Chesapeake Bay is the greatest center of oyster production. Long Island Sound, the Louisiana coast, and Puget Sound are other highly productive regions.

There are more than a hundred species of oysters. They vary widely in size, shape, habits, and flavor. The three most valuable to man are the North American oyster (*Ostrea virginica*), the common European oyster (*Ostrea edulis*), and the rock oyster (*Ostrea*

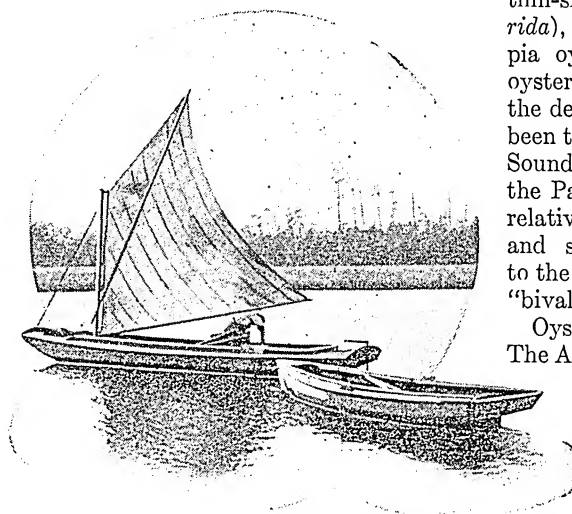
cucullata) found along the coasts of Japan, Australia, and many islands of the South Pacific. The native oyster of the Pacific coast of North America is a small,

thin-shelled species (*Ostrea lurida*), marketed as the Olympia oyster. A large, oblong oyster (*Ostrea gigas*) found in the deep waters off Japan has been transplanted to the Puget Sound area where it is known as the Pacific oyster. With their relatives, the clams, mussels, and scallops, oysters belong to the group of mollusks called "bivalves" (see Mollusks).

Oysters are very prolific. The Atlantic coast species may spawn five or six times during a season, which extends from May to August in the Chesapeake Bay, but is earlier in the southern waters and later in Long Island Sound.

One oyster may discharge almost half a billion eggs in a single season. Of course, only a few survive, otherwise the world's oceans would be so choked with oysters that the continents would be flooded by the overflow of water. Less than one per cent hatch and reach maturity. These are ready for the table in two to four years.

The eggs hatch and the young begin to swim in a few hours, and at the end of a day have formed a tiny bivalve shell. The newly hatched oyster, called larva or "spat," is a free-swimming creature, sometimes carried long distances with tides and currents. But most of the spat fall a prey to underwater enemies or suffocate in mud or undersea growth. After a few weeks the survivors, having



In shallow waters oysters are taken by means of oyster tongs, which consist of two rakes hinged to open and shut like pincers.

HARVESTING THE CROP ON OYSTER "FARMS"



This is an oyster bed at low tide. When oyster beds are planted in shallow tidewaters near the shore, it is easy for the oyster farmer to gather those which have reached the proper size. Such an arrangement is really an under-water farm, for the owner "seeds" the area with young oysters and guards them from enemies until they are ready for market.



In this oyster farm on Cape Cod the oystermen have been gathering their crop with a dredge. They are now scooping the oysters into baskets and preparing to pack them for shipment.

A FRENCH "NURSE" FOR YOUNG OYSTERS



In France practically every step of the industry, from planting the young oysters or "spats" (shown in the upper corner) to gathering the grown oysters, is carried on by women. This hardy old peasant has just been examining a piece of tile covered with six-months' old oysters to see if they are enjoying good health.

grown to a barely visible size, attach themselves permanently to rocks or other submerged objects, and quickly lose the swimming organ and foot. They feed on microscopic water life and grow rapidly. At the end of a month or two they are as large as a dime, and are better able to protect themselves.

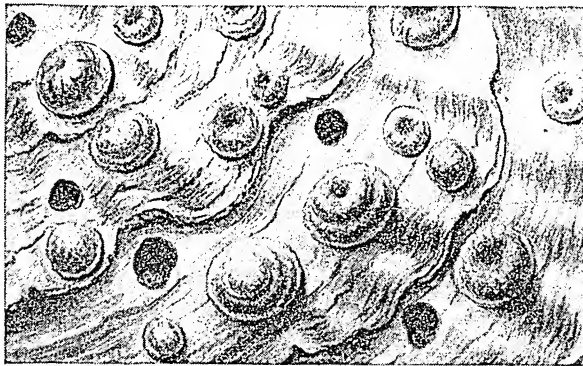
Ordinarily the shell is oval, somewhat enlarged at one end, and has two halves or valves, which open and close at the hinge. The half which attaches to the submerged object becomes hollowed out as it grows, in order to accommodate the growing oyster's body, but the upper half is flattened, or even pushed in from above. The soft body of the oyster is attached to the shell by a stout muscle, which extends from one valve or half of the shell through the animal's body to the other valve and enables the oyster to tightly close its shell. A fold called the mantle grows from each side of the oyster's body, completely lines the shell, and secretes new shell. Two folds conceal the mouth, and other very large flaps form the gills. The brownish part is the liver.

Throughout its life the oyster is attacked by hordes of enemies. Many young swimming oysters are con-

sumed by the adults and by fishes such as the menhaden, which strain their food from the water. Even the growing attached oyster, with its strong armor of shell, has a new set of shellfish enemies (called "drills") that bore holes through the valves and extract the soft parts. Sometimes starfish, moving over the bottom in great armies, as in Long Island

Sound, destroy several hundred thousand bushels of marketable oysters in a season. The starfish attaches itself to the lips of the oyster shell and pulls steadily with its numerous small suckers until the oyster's muscle weakens and the shell falls open; whereupon the starfish dines on oyster "on the half shell." Among other oyster enemies are fish armed with crushing teeth like the sting ray of California, and sponges which

A FOE THAT PIERCES THE OYSTER'S ARMOR



This is a small piece of shell of the ordinary oyster, greatly enlarged to show how it is attacked by the boring sponge. The oyster is also constantly beset by barnacles, worms, and mussels, and must struggle to keep itself free from aquatic vegetation.

burrow into and riddle the shell. The guardians of the oyster beds use great mops to entangle starfish, which are killed. Drills are snared by means of ingenious box dredges.

The oyster beds in the United States seemed at first inexhaustible. Owing, however, to lack of proper regulation in oyster fisheries, the beds have shown signs of failing. Through the activity of the

United States Bureau of Fisheries, the states interested have passed remedial laws, and oysters are now cultivated to a large extent on privately controlled beds in the United States.

The grower generally "plants" oysters in shallow bays and coves where the bottom is firm or not too muddy, at a depth of from one to five or six fathoms, though in Long Island Sound planting is practiced to a depth of 15 fathoms (90 feet). Luxuriant natural beds are found from above low water to a depth of 20 fathoms.

Having selected his site, which he usually leases from the state, the planter marks it off with stakes and buoys, and then smooths and clears the bottom of snags and debris, either at low tide, or by means of tongs or dredges. If the bottom is too muddy it is prepared by strewing it with a layer of clean oyster shells, cinders, or similar material, to which the spat may attach themselves. But unless an oyster spawning ground is near, there will be no spat; and in this case "seed" or partly grown oysters, usually one and a half inches or more in diameter, are sown over the bottom, about 500 bushels to the acre.

For a few weeks previous to marketing many oyster farmers transfer their crop from the beds in deeper waters to warm shallows, where the greater abundance of food causes them to fatten and improve in flavor. This process must not be confused with "plumping," or "floating," which consists simply in transferring the oysters to waters with less salt for a few days. In this case they absorb water, appearing to be fat, though in reality they are merely bloated and are robbed of much food value.

In the United States oysters are collected in two ways. In shallower waters they are taken by means of oyster tongs, which are like two long-tined rakes, hinged so as to

open and close like shears. In deeper water, down to 15 or 20 fathoms, a dredge is used, dragged by power or sail boats.

This is a rectangular iron framework, usually about four feet across, with sharp edges or with long teeth upon one side, while attached to the other is a large open-work bag of cord or iron. The dredge is dragged over the bottom, the oysters are caught in the bag and brought in to the surface.

Oysters are shipped long distances in refrigerator cars or in ice, either alive in the shell or in bulk. Taking the oyster out of the shell, called "shucking," is very rapidly done by boys and women; with a short strong knife they cut the muscle that holds the valves and with another stroke scoop the oyster

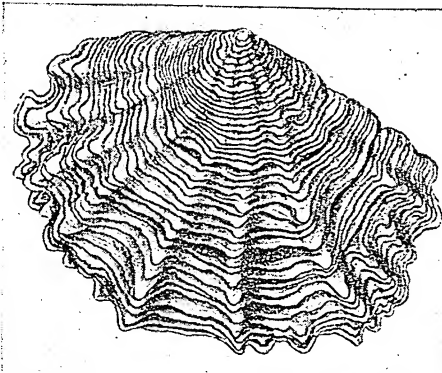
out. In the United States oysters of various sizes and with variously shaped shells are popularly named for the regions where the type originated. For example,

"blue points," "cotuits," and "lynnhavens" are named respectively for places on the shores of Long Island, Massachusetts, and Virginia. They are now grown in planted beds elsewhere. The average annual catch for the United States used to be 25,000,000 bushels, but it is now much less because of wasteful methods, water pollution, and parasites.

Oysters have been under culture longer than any other water creature. A simple type of cultivation, with the formation of artificial beds, flourished in China at a very remote period. In Italy oyster culture began about 100 B.C. In the important maritime countries of Europe fully 90 per cent of the output now represents artificial cultivation. Cultural methods have attained a

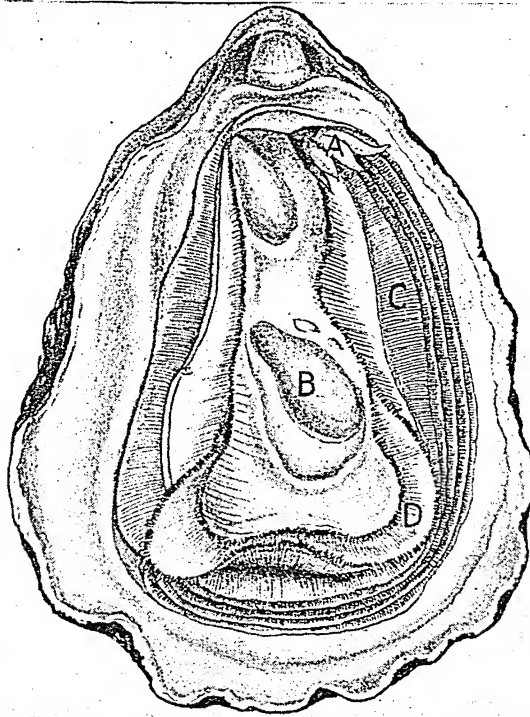
high degree of perfection, especially in France, Holland, and Japan. In France oysters are cultivated in oyster parks. The "spat" is collected on fagots of brush, tiles, or other collectors

THE GREAT PEARL MAKER



While pearls have been found in every variety of oyster, the genuine pearl oyster is found principally in the East Indies. It is often eight to ten inches in diameter.

ANATOMY OF THE OYSTER



The mouth is formed by two sets of labial palps (A). The position of the adductor muscle (B) is shown on an empty shell by a dark patch, marking the spot where it was attached. It is with this muscle that the oyster holds its shell closed so tightly. The gills (C) project into the mantle (D), which is the body wall.

placed near spawning beds. The "seed" oysters are then removed to partially enclosed grounding ponds which admit the tides through sluices and flood gates. When fully grown the oysters are fattened in small ponds or "claires."

Oysters rank high in food value. They are a good source of vitamins A, B, D, and G, and are second only to calf's liver as a source of iron and copper. No food product is subject to more rigid sanitary regulations by state health authorities. (*See also Pearl.*)

kansas before a higher plateau known as the Boston Mountains, whose bold escarpment rises a thousand feet above the White River Valley. These wild and deeply dissected mountains are about 2,200 feet high, 200 miles long, and 35 miles wide. They descend on the south to the valley of the Arkansas River.

Along the ridges and deep in the "hollers" the farmers raise corn, cattle, and pigs. But most of the soil is a flinty mantle of chert which gives a poor return for their labor. National forests cover many

IN THE PLAYGROUND OF THE MIDDLE WEST



The quiet charm of the Ozarks is felt in the scene pictured above, with its dirt road winding through hardwood and pine forests to the lonely hills. The stake and rider fence is typical of a country where timber is abundant.

OZARK MOUNTAINS. The upland region of the Ozark Mountains rises like an island in the midst of the middle western plains. Until modern highways penetrated its beautiful forested hills and deep coves, it remained isolated—a bit of the American frontier left behind and almost forgotten in the march westward. Here still dwell sturdy pioneers who prefer freedom to wealth, a far view from the top of a mountain to the comforts of the plain.

More properly known as the Ozark Plateau, the region covers about 40,000 square miles in southern Missouri, northwestern Arkansas, and northeastern Oklahoma. The plateau is a low dome thrust upward less than 2,000 feet above the surrounding plains. The top of the dome is in the St. François Mountains of southeastern Missouri. Here the limestone covering has been stripped by erosion, leaving the crystalline core of the continent exposed in such hills as Iron Mountain (1,077 feet) and Pilot Knob (1,014 feet).

Southward, the plateau is a rolling plain, heavily forested, and pocked with caves and sink holes where underground water has dissolved the limestone. The White River and its tributaries have carved deep gorges across the plateau. The Ozarks end abruptly in Ar-

thousands of square miles. In the western part of the plateau there is more level surface, and the limestone covering remains to create rich soil. Here dairying, truck gardening, and fruit raising are commercially important. Zinc deposits around Joplin, iron in the St. François Mountains, lead, manganese, barite, and tripoli are among the many minerals.

Scenery is the greatest asset of the Ozarks. Modern highways have brought its beautiful hills and forests, its lakes and streams, within a day's drive of ten million people. Dams across Ozark streams, built to give hydroelectric power and water to the cities of the plains, have proved perhaps equally valuable in providing new recreational facilities. The Lake of the Ozarks, created by Bagnell Dam across the Osage River, and Lake Taneycomo behind Forsyth Dam on the White River are Missouri's most popular resorts. Spavinaw Lake Dam and the Grand River Dam, both in Oklahoma, have created popular lake resorts. The mineral waters of Eureka Springs, Ark., have attracted health seekers since the middle 19th century. The word Ozark is a corruption of the French name for the region, *Aux Arcs*, meaning "at the bows," so-called for the Bow or Quapaw Indians.

THE EASY REFERENCE FACT-INDEX

GUIDE TO ALL VOLUMES FOR SUBJECTS
BEGINNING WITH

N-O

TO SAVE TIME

USE THIS INDEX 

EDITOR'S NOTE ON NEXT PAGE TELLS WHY

SPECIAL LISTS AND TABLES

NATIONAL FLOWERS	272
COMMON NAUTICAL TERMS	275-76
OCEANS AND SEAS OF THE WORLD	294

Numerous other lists and tables in the fields of geography, history, literature, science, mathematics, and other departments of knowledge will be found with their appropriate articles in the main text

EDITOR'S NOTE

EVERY user of Compton's Pictured Encyclopedia should form the habit of *first* turning to the Fact-Index section at the end of each volume when in search of specific information. This index is a miniature work of reference in itself and will often give you directly the facts, dates, or definitions you seek. Even when you want full treatment of a subject, you will usually save time by finding in the index the exact page numbers for the desired material.

All page numbers are preceded by a letter of the alphabet, as A-23. The letter indicates the volume. If two or three page numbers are given for the topic you are seeking, the first indicates the more general and important treatment; the second and third point to additional information on other pages. Where necessary, subheadings follow the entry and tell you by guide words or phrases where the various aspects of the subject are treated.

The arrangement of subheadings is alphabetical, except in major historical and biographical entries. In these the chronological order is followed.

The pictures illustrating a specific subject as a rule appear on the same pages as the text to which you are referred. But often illustrations placed elsewhere will prove of additional interest and value. These are indicated by the word *picture* followed by a page number.

A picture reference is frequently intended to call attention to details in the text under the illustration as well as to the illustration itself. This picture-text, therefore, should always be carefully read.

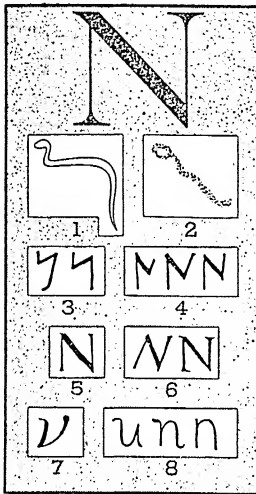
The pronunciations given are those preferred by the best and most recent authorities; alternative pronunciations are indicated only where usage is equally divided. For foreign names the native pronunciation is given except where the English pronunciation has become thoroughly established, as in "Paris," "Barcelona," "Seine."

In recent years hundreds of foreign geographical names have been changed, either officially or by custom. Both old and new names are given at the appropriate places in the alphabet.

Populations are given in round numbers, except for places in the United States and Canada, where the figures are those of the latest official census. Distances between points are map or air distances, not distances by railroad.

THE EASY REFERENCE FACT-INDEX

Reg. U. S. Pat. Off.



OUR LETTER N probably started in ancient Egypt as a picture of a snake (1). To the Egyptians the picture meant 'snake'; but soon after 2000 B.C., a Semitic people called the Seirites adopted it as an alphabetic sign for the sound of 'n'. They did so because their word *nahash* for 'snake' began with this sound.

For their sign the Seirites made a crude snake (2). The later Canaanite-Phoenician alphabet made the sign with angles (3). The Semitic names for the sign resembled the name *nun* in Hebrew.

When the Greeks learned to write from the Phoenicians, they changed the name of the sign to *nu*, and made all the strokes about the same length (4). Later they equalized the upright strokes (5). Meanwhile the Romans had worked out the same change in Latin (6). From Latin, the letter came without change into English.

The small handwritten 'n' always has been a quickly made, simplified imitation of the capital. In Greek it was a direct imitation with one stroke omitted (7); in medieval Latin and in English it is more like the capital, with curves substituted for angles (8). The printed small 'n' imitates the handwritten character.

NOTE.—For the story of how alphabetic writing began and developed, see the articles Alphabet; Writing.

Nabateans (*nāb-ā-tē'ānz*), people of ancient Arabia, flourished from about 312 B.C. to 105 A.D. ruins of Petra, picture A-325

Nablus (*nā-bls's*), Palestine. See in Index Shechem

Na'bob, origin of word H-234

Nabonass'sar, king of Babylonia 747-734 B.C.; seems to have been vassal of Tiglath-Pileser III, who had invaded Babylonia but had permitted Nabonassar to remain in nominal independence.

Nabonid'sus, last ruler of Chaldean Empire, and father of Belshazzar; succeeded to throne 556 B.C., but gave more time to building temples than to preparing for resistance to the Persians, who took him prisoner in 538 B.C.

temple, picture A-258

Nabopolas'sar, king of Babylonia 625-605 B.C., founder of the Chaldean Empire; aided by Medes he captured Nineveh in 606 B.C.; father of Nebuchadnezzar.

Naboth (*nā'bōth*), owner of a vineyard coveted by Ahab, and obtained by Jezebel through murderous fraud (I Kings xxi).

Nacimiento, manger scene in Spanish Christmas celebration C-227, 229c

Nacogdoches (*nāk-ō-dō'chēz*), Tex., town about 140 mi. n.e. of Houston; county seat and center of rich cotton and agricultural district; pop. 7538; in 18th century was Spanish mission; captured by Americans 1812.

Naere (*nā'kēr*), or mother-of-pearl S-107, P-97 obtained from abalone S-108

Na'dir, in astronomy, the point in the celestial sphere opposite to the zenith, that is, directly underfoot.

Nadir Khan (1880-1933), ruler of Afghanistan with title of Nadir Shah; commander in chief of Afghan army 1919; minister to France 1924-26; A-31

Nadir Shah (*nā'dīr shā*) (1688?-1747), ruler of Persia P-134 diamonds D-62 Peacock Throne D-43

Naevius (*nā'vī-ūs*), Gnaeus, first Roman epic poet (3d century B.C.) L-68

Naga (*nā'gā*), a number of tribes in

the hill country of Assam, British India; intelligent and industrious; language Indo-Chinese.

Nagana (*nā-gā'nā*), a disease of animals caused by tsetse fly T-148

Nagasaki (*nā-gā-sā'kē*), Japan, important seaport on w. coast of Kyushu Island; pop. 255,000; beautiful natural harbor; coal, cotton goods, rice exports; shipbuilding: map J-186

Nagler propeller W-52

Nagoya (*nā-gō-yā*), large city of Japan; pop. 1,335,000: N-1

Nagpur (*nāg'pur*), British India, trade city, cap. of Central Provinces and Berar, 450 mi. n.e. of Bombay; pop. 215,000; railway center; cloth manufactures, manganese mines: maps I-30, A-332c

Nagyszeben (*nāg'sēb-ēn*), Rumania. See in Index Sibiu

Nahua (*nā'wā*) nations, Indian tribes inhabiting Mexico in 15th century; allied with Aztecs: A-410, 408

Nahum (*nā'hūm*) (7th century B.C.), Hebrew minor prophet; his book, the 34th of the Old Testament, foretells the doom of Nineveh.

Naiads (*nā'yādz* or *nā'ādz*), in Greek mythology, spirits of the springs and fountains N-188

Naidu (*nā'idq*), Sarojini (born 1879), Hindu poet and reformer; born Hyderabad, India, of ancient Brahmin family; educated at Madras University, King's College, and Girton, Cambridge; married Dr. Naidu, medical officer of lower caste; leader in movement to give women greater equality and social freedom; she succeeded Gandhi as president of Indian National Congress; wrote in English poems of great beauty and depth of feeling ('The Golden Threshold'; 'The Bird of Time'; 'The Broken Wing').

Nails, of fingers and toes S-157, H-338 Nails, hardware N-1-2

Nainsook (*nān'suk* or *nān'suk*), fine, soft-finished white cotton fabric with lustrous finish on one side; lighter in weight than longcloth.

Nairobi (*nā-rō'bī*), capital of Kenya Colony, British East Africa; pop. 47,000; game-outfitting point; headquarters of Uganda railway: maps E-139, A-42a

Naismith James (1861-1939), American educator, born Alomonte, Ontario, Canada; professor of physical education, University of Kansas, Lawrence, after 1898 originated basketball B-59

Najaf (*nā-zhāf*), Iraq, town 90 mi. s.w. of Baghdad; pop. about 25,000; pilgrimage center.

Na'jera (*nā'hā-rā*), Manuel Gutierrez (1859-95), Mexican writer L-67w

Naked flowers F-121

Names, personal N-2-3

Chinese custom C-219 superstitions about M-30

Nampa, Idaho, fruit and dairy center in s. w. of state, 30 mi. from Oregon border; pop. 12,149; named for Indian chief, Nampuh; noted for its potatoes and onions; car shops.

Namur (*nā-mūr*), Belgium, fortified industrial town 35 mi. s.e. of Brussels at junction of Sambre and Meuse rivers; pop. 30,000; repeatedly besieged; occupied by Germans 1914 and 1940: map B-87

'Nana', a novel by Emile Zola (1880) depicting the rise and fall of an untalented but beautiful actress at the time of the Second Empire in France.

Nanai'mo, British Columbia, port on Vancouver Island opposite Vancouver; in coal-mining region; pop. 6745; coal mining, agriculture, fur-trading, gold mining; exports coal, lumber, herring: map C-50b

Nana Sahib (*nā'nā sā'ib*) (1825?-60?), Hindu prince, leader of Indian Mutiny of 1857 I-39

Nanchang', China, cap. of Kiangsi province; pop. 300,000; trade and manufacturing city: map C-212

Nancy (*nān'si*, French *nān-sē*). France, fortified city 175 mi. e. of Paris; pop. 120,000; noted university; unsuccessfully besieged by Germans 1916; fell to Germany 1940: map F-179

battle (1477) C-153

old city gate, picture F-170

'Nancy' (*nān'si*), famous brig in American Revolution W-105

Nankeen', a cotton cloth first made at Nanking, China, from yellow cotton of that region; now made of ordinary cotton and dyed yellow or brownish-yellow.

Nanking', China, city on Yangtze River; made cap. of China in 1928; pop. 1,000,000: N-3, map C-212
 Japanese puppet government C-221n
 "Nanking," or "Old Nanking," porcelain P-330

Nanking Treaty (1842), between China and Great Britain closing Opium War C-221j

Nankow Pass, in Great Wall of China P-102

Nannar, moon god of Chaldea temple at Ur, picture A-3

Nansei (*nān-sā'e*) Islands, Japan, also Liukiu and Ryukyu; 921 sq. mi.: J-185, map J-186

Nansen (*nān'sēn*), Fridtjof (1861-1930), Norwegian scientist, Arctic explorer and humanitarian; professor of oceanography at Oslo; influential in separation of Norway from Sweden, and first minister to England from Norway, 1906-8; after 1st World War he worked for repatriation of prisoners and directed relief for refugees from Russia and the Near East, for which he received Nobel peace prize in 1922
 Arctic explorations P-282, maps A-277, G-176

Nantes (*nānt*), historic city and port of France; pop. 195,000: N-3-4

Nantes, Edict of (1598), decree granting religious freedom to French Huguenots H-354, H-279

Nanteuil (*nān-tū'yū*), Robert (1630-78), French portrait engraver, whose heads show skillful composition, forceful modeling, and truthful characterization; one of the greatest engravers of all time engraving of Turenne, picture E-295

Nanticoke, Pa., coal-mining town on the Susquehanna River 7 mi. s.w. of Wilkes-Barre; pop. 24,387; mining and agricultural implements, silk and rayon yarns: map P-112

Nanticoke (*nān-ti-kōk*) Indians, an Algonquian Indian tribe formerly living in Maryland.

Nantucket fishcart T-122

Nantucket (*nān-tūk'ēt*) Island, off s.e. coast of Massachusetts; about 15 mi. long; separated from Cape Cod by Nantucket Sound; town of Nantucket, a summer resort: map M-82

Cape Cod canal avoids shoals C-80

Nantucket lightship, picture L-134

Naomi (*nā-d'mi*), mother-in-law of Ruth R-201-2

Nap, of cloth W-145, picture W-144
 teasel plant used T-81-2

Napaeas (*nā-pē'ādz*), in Greek mythology, nymphs of valleys N-188

Naperville, Ill., city 28 mi. w. of Chicago; pop. 5272; North Central College, Evangelical Theological Seminary.

Naph'tha, an oil distilled from petroleum P-149

soap S-177
 solvent for rubber R-163

Naphthalene, coal-tar product C-289

Napier (*nāp'yēr*), Sir Charles James (1782-1853), English general; fought in Spain and France in Napoleonic wars; in 1841 in India commanded army which conquered the Sind, and for six years successfully governed the territory he had conquered; a brave but reckless soldier, greatly loved by his men.

Napier, John (1550-1617), Scottish mathematician, inventor of logarithms M-90, P-341

Napier, port on e. coast of North Island, New Zealand; pop. 15,000; wool and meat exports: maps A-372a, P-10b

Napier of Magdala, Robert Napier, first Baron (1810-90), British soldier; took part in first and second Sikh wars, relief of Lucknow, and later Indian campaigns; commanded expeditions which stormed Peiho ports in China 1860; captured Magdala, stronghold in Ethiopia in 1868.

Naples, Italy, also Napoli, 3d largest city of the kingdom; pop. 900,000: N-4-5, map I-156
 antiquities P-301, N-4
 banner of the Middle Ages F-97, color plate F-88
 history N-4-5
 annexed to Holy Roman Empire H-275

Charles VIII captures C-152
 Joseph Bonaparte king B-171
 Garibaldi conquers for Italy G-15
 Mt. Vesuvius V-291-2

National Museum, table M-392

Naples, Bay of, inlet of Mediterranean in s.w. Italy, famous for scenery N-4

Naples, University of N-4, 5

Naples National Museum, Naples, Italy; established 1738: N-4

Pompeii collection P-301

Napo (*nū'pō*), river rising in Ecuador; flows 700 mi. s.e. to Amazon: map C-305

Napoleon (*nā-pō'lē-ōn*, French *nā-pō-lē-ōn*) I (1769-1821), emperor of the French N-5-10, Outline F-185. For military campaigns see in Index Napoleonic Wars

Alexander I, relations with N-10
 Bonaparte family B-171-2

code of laws N-8-9
 "continental system" fails N-10

Cuvier honored by C-418
 Elba and the "Hundred Days" N-10, W-48

empire, extent of N-9, map E-326c
 Josephine Beauharnais J-227-8

Louisiana sold to U.S. L-208-9
 "Marengo," famous horse H-343

Marie Louise N-9, picture N-7
 Ney N-136-7

reforms N-8-9
 St. Helena N-10

standard, imperial F-84
 sugar beet industry S-319

Talleyrand's relations with T-6
 textile industry T-68

tomb P-74

Napoleon II. See in Index Reichstadt, Duke of

Napoleon III (1808-73), emperor of the French N-11

American Confederacy and C-256
 Franco-Prussian War and surrender at Sedan F-187-8, S-73. See also in Index Franco-Prussian War

Mexican expedition M-142d
 Paris beautified P-75

Sardinia-Piedmont aided by I-157, V-294; Solferino R-59, C-120-1

Victor Hugo opposes H-353

Napoleon, former French gold coin valued at 20 francs, or about \$3.86 when current; bore picture of head of Napoleon I: picture M-220a

Napoleonic code N-8-9

Louisiana Code based on L-207
 opposed women's rights W-132

Napoleonic Wars (1796-1815) N-6-10, chart H-301. See also in Index Vienna, Congress of

Amiens, treaty of A-187
 Baltic, battle of the B-32, N-63

"continental system" N-10: effects on U. S. W-8, 9

Egyptian expedition N-7
 Italy and Austria N-6-7

Jena, battle of N-8, P-359
 Malta, seizure of M-43

Nile, battle of the N-63
 Peninsular War N-10, W-71

Pyramids, battle of the N-7
 Russian invasion and retreat from Moscow N-10, picture N-8

Tilsit, treaty of N-10, A-113
 Trafalgar, battle of N-63-4, E-272

Waterloo, battle of W-48

Napoli (*nā'pō-lē*). See in Index Naples

Naprathy (*nā-prā'yā-thi*), system of treating disease by manipulation, based upon theory that most bodily ailments are caused by abnormal strains in ligaments, particularly those of the spine.

Nara (*nā'rā*), picturesque old city of Japan; 25 miles south of Kyoto; capital from 709 to 784; contains beautiful ancient temples, shrines, giant Buddha image; pop. 59,000 art museum J-200

Narbada (*nār-bā'dā*), or Nerbudda, river in India, rising in n. of Central Provinces, flowing 750 mi. to Gulf of Cambay; held sacred by Hindus: map I-30

Narbonne (*nār-bōn'*), town in s. France 5 mi. from Mediterranean; pop. 30,000; coopering, distilling; early Roman colony, Narbo Martius.

Narcissus (*nār-sis'ūs*), in Greek mythology N-11

loved by Echo E-143

Narcissus, plant N-11-12
 how to plant G-7

Narcotics, substances producing sleep, stupor, or relief from pain N-12

anti-narcotic laws N-12, H-272, O-235

cocaine N-12, A-196, B-111
 efficiency reduced by W-148

hashish, or marihuana N-12, H-272
 hemp N-12

laudanum N-12, P-275
 morphine N-12, P-275

opium O-234-5, N-12, P-304
 poisoning, treatment F-64, P-275

Narcotics, Federal Bureau of N-12

Narcotics Limitation Convention N-12

Nard. See in Index Spikenard

Nares Deep, a depression in floor of Atlantic Ocean, about 700 mi. n.e. of Puerto Rico; the most northerly and largest of the 3 deeps which lie n.e. of Puerto Rico; named for British Admiral George Strong Nares (1831-1915).

Narghile (*nār'gī-lā*), oriental tobacco pipe, picture P-131

Narragan'set, tribe of Algonquian Indians; lived along w. side of Narragansett Bay, R. I., and controlled surrounding regions: I-53

befriending Roger Williams W-104
 King Philip's War K-23

threaten Plymouth P-261

Narragansett Bay, inlet of Atlantic, indenting coast of Rhode Island R-96, map R-97

Providence harbor P-357

Narrative poetry P-271

Narrow gauge railroad R-39

Narrows, The, strait between Brooklyn and Staten Island N-123

Nurses (*nūr'sēz*) (478?-573?), general of the Byzantine Empire, grand chamberlain to Justinian J-231

Narva (*nūr'vā*), Esthonia, seaport on Russian frontier; pop. 24,000; cotton and lumber trade; makes textiles: map E-326e

Narva, battle of (1700) C-154

Narváez (*nār-vā'āth*), Pánfilo de (1480?-1528), Spanish soldier and adventurer, one of earliest explorers of Florida

Cortez and C-372-3

explorations F-109, map F-111

Nar'vik, Norway, port on w. coast;

pop. 10,000; railway terminus: N-176, map N-173

Nar'whal, sea animal related to porpoise P-305, W-77
ivory from tusks I-176

Nasal bone, one of the bones forming the arch of the nose S-156

Nas'by, Petroleum V. pen name of David R. Locke (1833-88), American humorist, author of the "Nas-by letters" in favor of the Lincoln policy which appeared in the Toledo Blade during Civil War.

Nascapee (näs-kä'pē), an Algonquian Indian tribe living on the lower St. Lawrence River, Quebec.

Nase'berry, or sapodilla, a tropical tree; source of chicle gum: C-185
fruit F-212

Naseby (näs'bi), battle of C-400

Nash, Francis (1720?-77), American soldier, born Prince Edward County, Va.; settled in Orange County, N. C.; member of assembly 1771, 1773-75, and captain in Crown army until 1775; twice delegate to provincial congress; advanced to brigadier general of First North Carolina Regiment; fatally wounded in battle of Germantown; monument at Guilford Courthouse, N. C.

Nash, John Henry (born 1871), American printer, born Woodbridge, Ontario; printer in San Francisco since 1895; folio edition of Dante probably his best work; one of the outstanding contemporary typographers.

Nash, Ogden (born 1902), American humorist, born Rye, N. Y.; noted for light satirical verse ('Hard Lines'; 'Free Wheeling'; 'I'm a Stranger Here Myself'; 'Bad Parents'; 'Garden of Verse').

Nash, Richard (1674-1762), English society leader, popularly called "Beau" Nash; he made Bath a resort of fashion and ruled it like a monarch.

Nash (or Nashe), Thomas (1567-1601); English poet, dramatist, and pamphleteer; satirical, sometimes violent, tracts; pioneer in English novel of adventure ('The Unfortunate Traveller, or the Life of Jack Wilton').

Nash'ua, N. H., manufacturing city on Merrimack and Nashua rivers, 34 mi. n.w. of Boston; pop. 32,927; cotton textiles, shoes, refrigerators, paper; fish hatchery: N-86, 88, map N-86

station for wild animals Z-220

Nashville, Tenn., state capital on Cumberland River; pop. 167,402: N-12-12a, map T-46

capitol, picture T-47
George Peabody College for Teachers, picture T-48

Peabody endowment P-90-1

Nashville, battle of, in American Civil War (1864) T-82
national cemetery N-12a

Nasmyth (nä'smith), James (1808-90), Scottish engineer and inventor I-116-17

steam-hammer I-144, T-110

Nasr-ed-Din (nä'sr ed den) (1829-96), shah of Persia; succeeded 1848; introduced postal system.

Nassak, a diamond, picture D-63

Nassau (nä'sg), capital and seaport of Bahama Islands; situated on New Providence Island, 200 mi. s.e. of Miami, Fla.; pop. about 19,000: B-15, map U-188c

Nassau (nä'sou), district in cent. Germany in Rhine basin; an independent duchy until 1866 when ab-

sorbed by Prussia and became part of province of Hesse-Nassau.

Nassau grouper, a fish of the sea-bass family, picture P-355

Nast, Thomas (1840-1902), American caricaturist, born Bavaria; because of cartoons ridiculing those who opposed Civil War called by Lincoln "our best recruiting sergeant"; his keen, satiric cartoons in Harper's Weekly helped destroy Tweed ring; originated many still current political emblems — Democratic donkey, Republican elephant, and Tammany tiger.

Nasturtium N-12a

leaf, picture L-89

pollen grain, picture F-125

Natal (nä-täl'), seaport near n.e. tip of Brazil, cap. of province of Rio Grande do Norte; about 550 mi. from Bahia, 1400 mi. from Rio de Janeiro; jumping-off point for airplane flights to Africa; port for coastal trade; pop. about 45,000: map S-208b

Natal (nä-täl'), province of Union of South Africa; 35,284 sq. mi.; pop. 1,950,000; cap. Pietermaritzburg: N-12a, S-202-3, maps S-202, A-42a
dipping cattle, picture C-107
history S-199-203
Turgela River, picture S-201

Natale (nä-täl'a), Italian Christmas C-226

Natchaug (nä-chä'g'), River, Conn., a stream uniting with the Willimantic to form the Shetucket, map C-336

Natch'ez, Indian tribe of s. United States, formerly lived in Mississippi about present city of Natchez.

Natchez, Miss., industrial city and port on Mississippi River; pop. 15,296; exports cotton and beef cattle; cotton and cottonseed-oil mills, packing plants, lumber mills; settled as Fort Rosalie by Bienville (1716); occupied by Federal troops in 1863: map M-200

Natchez Trace, road R-116, N-22f

Natchitoches (näk'i-tôsh'), La., parish seat of parish of same name, 72 mi. s.e. of Shreveport, on Red River; pop. 6812; founded 1714 by French: S-222

Na'than, Hebrew prophet; rebuked David for treachery to Uriah (II Samuel vii, xii).

Nathan, George Jean (born 1882), American editor, author, dramatic critic, born Fort Wayne, Ind.; one time editor, with H. L. Mencken, of The Smart Set and American Mercury ('The Popular Theatre'; 'Comedians All'; 'Art of the Night'; 'Since Ibsen').

Nathan, Robert (born 1894), American writer, born New York City ('A Winter Tale', poems; 'The Puppet Master', 'Jonah', 'One More Spring', 'The Road of Ages', 'Winter in April', 'Portrait of Jennie', prose fantasies of beautiful style).

Na'tick, Mass., town on Charles River at head of Cochituate Lake 15 mi. s. of Boston; pop. 13,851; boots and shoes, baseballs, paper boxes, tools; founded 1650 by John Eliot as a home for Indian converts.

Natton, Carrie A. (1845-1911), American reformer, born Kentucky; in crusade for prohibition aroused sensation by smashing Kansas saloons that were operating in defiance of anti-liquor laws.

Nation, political unit S-278-9

National Academy of Design, The, incorporated under present name 1828; membership limited to 125 painters, 25 sculptors, and 25 archi-

itects and engravers; school of design in connection; headquarters New York City.

National Academy of Sciences, American society incorporated 1863 for purpose of making investigations and reports, at call of U. S. government, on any subject of science or art; members number about 140 with about 45 foreign associates; meetings held in Washington, D. C.

National Americanism Commission, of American Legion A-176

National American Woman Suffrage Association W-132

National Archives, The, at Washington, D.C., created by act of Congress 1934 to inspect and preserve archives and records of the U.S. government, historical material, and motion pictures of historical activities; publishes the Federal Register which contains presidential proclamations, orders, and documents; work directed by Archivist of the U.S. who is appointed by the President with the advice and consent of the Senate.

National Assembly, French parliament F-178-9

French Revolution F-201-2, E-305

National Association of Audubon Societies B-145d, 146, A-363

egret protected S-297

National Association of Junior Republics G-54

National Aviation Day H-321

National banks, U. S. B-42, 44

Federal Reserve membership F-21-2
first established B-44
supervision U-223

National Baseball League B-53

National battlefield sites N-22f

National Board of Fire Underwriters, in New York City; established 1866; protects interests of fire insurance companies, establishes safety standards in building construction, represses incendiarism and arson: pictures S-2c

National Broadcasting Company R-30

National Cancer Institute, at Bethesda, Md., created 1937 by an act of Congress for the purposes of conducting researches, investigations, experiments relating to the cause, prevention, diagnosis, and treatment of cancer. A division of the U.S. Public Health Service.

National Cathedral, Washington C-100

National Catholic Welfare Conference (NCWC), an agency to promote welfare of Roman Catholics in U. S.; organized 1919; has 5 departments: education, press, social action, laws, lay organization; succeeded National Catholic War Council, founded 1917.

National cemeteries, U. S. N-22f

Arlington, Va. U-225: tomb of unknown soldier, picture U-225

Civil War N-22f

Europe, American cemeteries in U-225-6

National City, Calif., residential and trading city on San Diego Bay, 5 mi. s. of San Diego; pop. 10,344.

National Civic Federation, an organization founded in 1901 for the study of social and industrial problems; executive committee comprises representatives of the public, employers, and wage earners.

National Collection of Fine Arts, at Washington, D.C., table M-392

National Collegiate Athletic Association (N.C.A.A.), organized 1905, to maintain high standards in intercollegiate athletics; formulates playing rules, conducts championships.

National Committee for Mental Hygiene M-118

National Committee on Boys and Girls Clubs F-165

National Congress of Mothers P-70

National Congress of Parents and Teachers P-70

National Conservation Commission C-343

National Consumers' League, organized 1898 to regulate conditions of manufacture by helping to enforce labor laws, investigating conditions of labor, etc., and awarding league's label to manufacturers conforming to its standard; state leagues in U. S. since 1891.

National convention, for nominating presidential candidate in U.S. P-292

National dances F-135, pictures F-132, 133, 134

National debt N-13
Bank for International Settlements I-110

reparations, 1st World War. *See in Index* Reparations

United States N-13

Debt Funding Commission W-176-7

14th Amendment U-218

Hamilton funds H-205

Liberty bonds W-170

limit raised R-1460

war debts N-13: 1st World War W-175-7, pictures W-177, 178

National Defense Act (1916) W-168

National Defense Advisory Commission, appointed May 1940 by President Franklin D. Roosevelt to serve the then re-established Council of National Defense (created by Congress 1916); consists of commissioners in charge of industrial production, raw materials, employment, farm products, transportation, price stabilization, consumer protection; many of its duties taken over (1941) by Office for Emergency Management.

National Defense Mediation Board, U. S. L-44c, R-1460

National Education Association, American society of educators, organized at Philadelphia, 1857; devoted to the study of method, organization, and courses of study in all branches of educational work membership E-186

National Farmers' Alliance and Industrial Union, political party in U. S. P-293

National flowers, in many countries a flower, leaf, or plant has come to be adopted as a national symbol. The United States has no national flower, though the goldenrod, columbine, and other flowers have been suggested. Each state, however, has an officially chosen flower emblem. A list giving the flowers or plants that officially or by common consent have been adopted by various nations will be found in the *table* on this page

National Football League F-151d

National Forests, U. S. U-228, F-157, 159, N-22f, pictures F-157, 158. *See also in Index* Forest reserves, also Forests and forestry, *table* acreage U-230

fires and fire prevention F-159, pictures F-154, 156, 157

National Gallery, London, on north side of Trafalgar Square, built between 1832 and 1838 and several times enlarged; particularly rich in works of the Italian schools; the Flemish and Dutch schools and early British masters well represented; a branch, the Tate Gallery, houses modern British sculptures and paintings: L-189

NATIONAL FLOWERS

Many countries have adopted flowers as national emblems. In other lands while no flower has been officially adopted, a certain flower may be so typical of a country or may have become so closely associated with its history, literature, or folk-lore that it has come to be regarded as the national flower. Below are listed the chief countries in which a national plant or flower has been adopted by official decree or by common consent. The United States has no official national flower, although the goldenrod and other flowers have been suggested.

Australia	Golden wattle	Japan	Chrysanthemum
Belgium	Azalea	Lithuania	Rue (Ruta)
Canada	Maple leaf	Netherlands	Tulip
China	Plum flower	Paraguay	Orange blossom
Denmark	Forget-me-not	Persia	Red rose
Egypt	Lotus	Poland	Cornflower
England	Rose	Rumania	Rose
France	Lily (Fleur-de-lis)	Scotland	Thistle
Germany	Cornflower	Spain	Red carnation
Greece	Laurel	Switzerland	Edelweiss
Hungary	Tulip	Wales	Leek
Ireland	Shamrock	Yugoslavia	Lily of the valley

National Gallery of Art, at Washington, D. C., one of the world's great art museums, established 1937, opened 1941. The \$15,000,000 building, gift of Andrew W. Mellon, is built of pink Tennessee marble, and stands on the north side of the Mall, between 4th and 7th Streets. Designed by John Russell Pope to house Mellon's \$50,000,000 collection and later contributions, such as the Samuel H. Kress and the Joseph E. Widener collections. The gallery is administered as a bureau of the Smithsonian Institution: W-26, picture W-24

National Geographic Society, American organization with headquarters at Washington, D. C., founded 1888 to encourage exploration and observation and to spread geographical knowledge: G-34

National Grange, or Patrons of Husbandry, a secret society for farmers, founded in 1867 by Oliver H. Kelley, a Minnesota farmer on staff of Department of Agriculture; its purpose "to help the farmer help himself"; local units called granges became political forums, established coöperatives, and secured passage of Granger laws in Illinois, Iowa, Minnesota, Wisconsin; political activities later identified with Greenback and Populist parties; sponsors Juvenile Granges for boys and girls; active membership about 800,000

railroad rates movement A-313

National gross product. *See* Gross national product

National Guard, U. S. A-307c-d

1st World War W-169

police duties P-288

National Homes, Bureau of, government bureau in charge of national homes for disabled soldiers and sailors, established by Congress at end of Civil War.

National Housing Agency (NHA) R-146g, U-232

National income, United States U-198, N-12g

National Industrial Recovery Act (NIRA) R-146f, h, i, j
combines permitted T-147

National Institute of Health, headquarters at Washington, D. C.; a division of the U. S. Public Health Service for the investigation of causes and methods of prevention of diseases; developed from a small bacteriological laboratory established 1887 at Marine Hospital, New York City; present name adopted 1930; field stations throughout U. S.

National Inventors Council, a branch of the U. S. Department of Commerce in the national defense program; formed 1941; made up of scientific, technical, and military experts who examine inventors' discoveries and mechanisms for defense value.

Nationalism
development in Europe E-324
economic I-111-12, C-323: tariff aids

T-13a-b

fascist doctrines F-18

Nazism G-76-76a

National Labor Relations Board

R-146g, L-44d

National League of Women Voters, non-partisan association of women interested in the promotion of good citizenship and government W-132

National military parks N-22f

National Munitions Control Board N-75b, P-92

National Museum, United States. *See in Index* United States National Museum

National Order of Purple Heart, the third highest U. S. award for valor. The original decoration, awarded to only three men in the Revolutionary army, was a purple silk badge; the modern one is a heart-shaped, purple-enamelled medal with a gold border: D-31

National parks and monuments N-14-23. *See also in Index* names of various parks

administration N-18-19

Canada N-22f-23, pictures C-48, 50

foreign countries N-23: Chile, Easter Island E-140

United States N-14-22f: administration N-18-19; lists N-19-22e

National Park Service, U. S. N-18

bird refuges B-146

United States Travel Bureau N-19

National parkways N-22e-f

National Pike, or Cumberland Road R-112, 116

National Reclamation Act (1902) I-149

National Recovery Administration (NRA) R-146f, g

child labor code C-205

codes, enforcement R-146i

Supreme Court decision, effect R-146j

National Research Council, organization at Washington, D. C., established in 1916 by National Academy of Sciences for specific purpose of solving military problems; duties now embrace promotion of mathematical, physical, and biological sciences and their application to engineering, agriculture,

medicine, and other useful arts; work supported by gifts from Carnegie Corporation, Rockefeller Foundation, and other funds.

National Resources Planning Board (NRPB) R-146g, U-232

Nationals, legal term for the citizens or subjects of a nation foreign jurisdiction over I-108 United States citizenship C-238-9

National Safety Council S-2a

National Socialist Party (Nazi), in Germany H-311, G-75, 76-76b

National songs N-24-7

National territory, in international law I-109

National War Labor Board T-4

National Woman's Party W-133

National Woman Suffrage Association W-132

National Work, Day of the, official Nazi holiday in Germany (May 1).

National Youth Administration (NYA) R-146g, V-315

Nation at war N-12b-13, R-146p, *Outlines* H-310c, e, W-180. *See also in Index* World War, Second, *subhead* United States

Nations, Battle of (1813) N-10

Nations, law of. *See in Index* International law; international relations

Natividad (*nā-tō-vē-thūd'*), Spanish Christmas C-226

Nativity, Church of the, at Bethlehem B-101, C-229c, *picture* C-226

Nativity plays C-227, 229b

Na'trium, sodium. *See* Sodium

Natron (*nā'trōn*), naturally occurring sodium carbonate crystallized with water M-183. *See also* Soda glass-making G-101

Nattier (*nāt-yā'*), Jean Marc (1685-1766), French portrait painter; portraits of Peter the Great and noted ladies of Louis XV's court ('Magdalen' in Louvre).

Natural, in music, a note especially marked in a composition to nullify a sharp or flat indicated in the key.

Natural bridge, a bridge of rock left standing when water tunnels through a hill; usually found in limestone formations where the lower rock has been dissolved by water containing carbonic acid from decaying vegetation. Some famous natural bridges: Natural Bridge of Virginia, Natural Bridges and Rainbow Bridge in Utah.

Natural Bridge, of Virginia, on U.S. Highway No. 11, 39 mi. n. of Roanoke, formed by erosive action of Cedar Creek; used as shot tower during Revolutionary war; in words of Henry Clay, it "spans a river, carries a highway, and makes two mountains one": V-304

Natural Bridges, a national monument in Utah N-22c

Natural cement C-125

Natural gas G-23-4. *See also in Index* Gas, natural

Natural history, the study of nature in general; forerunner of the sciences of biology and ecology: B-111, E-145c. *See also in Index* Nature study

Natural History, American Museum of, in New York City, *table* M-393. *See also in Index* American Museum of Natural History

Natural history museums, *table* M-393

Naturalism, in literature, the tendency to reproduce life exactly as it appears, without idealization, in order to show clearly human motives and emotions; somewhat formless as compared to realism, but often difficult

to distinguish from it; represented in France by Zola and the Goncourts; in England by Hardy and Gissing; in United States by Dreiser and Sherwood Anderson drama D-96, 97

French literature F-197, Z-218 German literature G-63

Naturaliza'tion, admission of an alien to citizenship N-27, C-238-9

Act of 1798 A-127

Chinese and Japanese excluded I-24 collective C-238-9

not recognized in 1812 W-8

Naturalization Service, Immigration and, U. S. U-223, I-22-4, N-27 flag F-93, *color plate* F-87

Natural law, in physics conception in Newton's time N-110 formulation and change P-195

Natural resources, in economics E-146, 147, *picture* E-149

conservation. *See in Index* Conservation

Natural selection, Darwin's theory D-16, E-342. *See also in Index* Evolution

Natural vibration period electric circuits E-230

sound S-197

Nature, in art F-37-41

Nature Association, American. *See in Index* American Nature Association

Nature study N-28-43, *Outline* N-40-3 bibliography N-43

Nature worship, adoration of forces and objects in nature by primitive peoples. *See also in Index* Animal worship; Fire worship; Sun worship

ancient Egypt E-210

Druids C-124

Japan J-189-90

myths M-326

Phoenicians P-174

Nau, Jean David, late 17th-century French pirate; alias Francis L'Olonais; notorious for his cruelty; operated in Caribbean Sea; captured and tortured to death by Darien Indians.

Naucratis (*ng'krā-tis*), prosperous Greek colony in 6th century B.C. on Nile Delta, Egypt, 50 mi. s.e. of Alexandria.

Naudé (*nō-dā'*), Gabriel (1600-53), French historian and librarian, born Paris; had charge of the libraries of Cardinal Richelieu and Cardinal Mazarin ('Addition à l'Histoire de Louis XI').

Nau'gatuck, Conn., borough on Naugatuck River about 5 mi. s. of Waterbury; pop. 15,388; chemicals, rubber footwear, iron products.

Naugatuck River, tributary of the Housatonic, about 65 mi. long, *map* C-336

Nauheim (*nou'hīm*), Germany, watering place in Taunus Hills 22 mi. n. of Frankfurt-on-the-Main; pop. 9000; saline springs.

Nauplia (*ng'plē-ā*), Greece, fortified seaport in south; pop. 7000; commercial center; ancient and medieval tombs and buildings: *map* B-18

Nauru Island, small coral island in Pacific 26 mi. s. of equator; about 8 sq. mi.; pop. about 3000; British mandate; captured from Germans in 1st World War; valuable phosphate deposits: *map* P-10b

Nauset (*ng'sēt*), an Algonquian Indian tribe formerly living on Cape Cod, Mass.

Nausicaä (*ng-sik'i-ā*), in the 'Odyssey', Phaeacian princess who befriended the shipwrecked Odysseus O-205-6

Nautch dancer, of India, *picture* I-37

Nautical mile, *table* W-67

how measured at sea L-179

Nau'tilus, a mollusk, also called "pearly nautilus" N-44, M-218, *pictures* N-44, S-109

Nauvoo', Ill., village on Mississippi River 40 mi. n. of Quincy; pop. 1088; founded by Mormons 1839; pop. in 1846, 15,000

Mormons at M-258

Navajo (*nā'vā-hō*), or Navaho, Athapascan Indian tribe living in s.w. United States I-55

Arizona A-290

blankets and rugs R-173; weaving, *picture* A-294

customs described A-293

dance, *picture* F-135

houses I-60, *picture* A-292

jewelry I-55, A-293

living conditions F-10, I-55

New Mexico N-99

number I-67

Navajo Indian Reservation, largest Indian reservation in U. S. (nearly 10,000,000 acres), located mainly in Arizona, extending into New Mexico, Colorado, and Utah; occupied by about 40,000 Navajos who engage in sheep raising, farming, blanket weaving, and silversmithing: *maps* A-289, N-97, U-264

Navajo National Monument, Arizona N-22c

Naval Academy, U. S. N-44-5, A-211

Naval armament limitation. *See in Index* Armaments, limitation of

Naval aviation. *See in Index* Aviation, military and naval

Naval bases, U.S. N-52-3, N-56b, *maps* N-51, 52, *pictures* P-10d

Naval conference. *See in Index* Armament, limitation of

Naval holiday H-219, P-92

Naval Observatory, Washington, D. C. O-193, W-26, *picture* T-94

master clocks W-41

transit, *picture* T-94

Naval Operations, Chief of U-226

Naval Order of the United States P-89

Naval Personnel, Bureau of U-226

Naval reserve, force to supplement regular navy forces in time of war or emergency. The naval reserve of the United States, established in 1915, is made up of men who have served in the navy for four years or more.

Naval stores, wood distillation products commonly used on shipboard, including resin, tar, pitch, and turpentine. *See also in Index* Resins; Tar; Turpentine Georgia G-56 North Carolina N-157

Naval War College, organization for advanced training of naval officers, conducted by officers of U.S. Navy at Newport, R.I.; three one-year courses and a correspondence course offered.

Navarino (*nā-vā-rē'nō*), battle of (1827) G-162

Navarre (*nā-vār'*), medieval kingdom on both sides of Pyrenees; now divided between France and province of Navarra in Spain

Henry IV of France, king H-279

struggle with Moors S-230

Navarre, Henry of. *See in Index* Henry IV, France

Navar'ro, Mary Anderson de (born 1859), American Shakespearean actress (Rosalind, Juliet, Perdita); 'born Sacramento, Calif.

Navas de Tolosa (*nā'vās dā tō-lō'sā*), battle of (1212) M-255, S-230

Nave (*nāv*), in architecture A-264, *diagram* A-267

Cathedral of St. John the Divine,

picture A-273
Westminster Abbey, picture W-73
Navelwort. *See in Index* Chinese forget-me-not
Navigation N-46-50. *See also in Index* principal topics below by name. For list of common nautical terms *see table* on the following pages
almanacs O-193
army controls navigable inland and coastal waters U-224
barometer B-49-50
blind, radio used M-62
buoys L-134, A-7
chronometer W-39, N-46, 47, picture N-48
Coast and Geodetic Survey U-227
Coast Guard service C-289
compass C-325-6, picture C-326
dams aid blocked river beds D-6b
development A-142
earliest methods N-47, 49-50
gyro-pilot, steering device G-192
hydrographic surveying S-332
icebergs I-4
latitude and longitude L-70, N-46
Lighthouse Bureau L-134
lighthouses and lightships L-131-4
maps and charts M-58-9, N-47
pendulum used P-109, picture P-108
radio aids N-47; Marconi's inventions M-62; remote control R-25
safety devices, automatic A-385
sextant L-70, N-46, A-78, picture N-48
ship's log L-179-80
signaling S-143; wireless M-62
spherical trigonometry T-141
storms S-298
tide tables T-92
time at sea T-95-6, O-193
time signals O-193
winds W-112-13
Navigation, Bureau of, former name of Bureau of Naval Personnel
Navigation, Bureau of Marine Inspection and, U. S. Department of Commerce U-227
safety work S-2b
Navigation Acts, British A-159
smuggling U-234
Navigators Islands, former name of Samoa Islands. *See in Index* Samoa
Navy N-50-56f. *See also in Index* Armaments, limitation of; Aviation, military and naval; Marine Corps; United States Navy
armor plate construction N-54-5, M-224-5
artillery A-319-21, N-53-4, 55, 56, pictures A-322, N-50
battleship N-53-5. *See also in Index* Battleship
books about N-56f
destroyer S-312, 314, N-55-6, pictures N-56, W-161
development N-56d-f
ancient and medieval S-118
first steam warships F-217, S-122
modern war vessels N-53-6
electric drive N-55
history N-56d-f
ironclads M-225, E-300, N-56e, pictures C-255
marine engineering E-267
naming American ships N-56a
navies of the world N-56f
oil as fuel S-124
submarine S-311-14, N-56, pictures S-311, W-161
greatest depth reached, picture A-63
periscope P-126, picture S-313
torpedoes and mines T-113-16, N-56, pictures T-114, 115
Navy, Department of the, U. S. U-226, chart U-229
Alaska governed by A-103
building W-26
Coast Guard C-289-90
flag of secretary F-93, color plate F-87
Marine Corps M-65

Naval Academy N-56b, S-40
Naval Observatory O-193, W-26
secretary N-56b, C-3; may become president U-221; Naval Academy appointments N-45
Navy and Marine Corps Medal, U. S. D-31
Navy bean B-65
Navy Cross, U. S., a decoration of honor D-31, color plate D-33
Navy Day (October 27) H-321
Navy Jack, U. S., flag F-98, color plate F-90
Naxos (năk'sôs), Greek Aegean island, largest and most fertile of Cyclades; 163 sq. mi.; pop. 17,000; famous wine; associated with Dionysus; ravaged by Persians 490 B.C.; seat of Venetian dukes 1207; captured by Turks 1566; map B-18
emery deposits E-260
Nayarit (nă-yă-rê'), Mexico, state on cent. w. coast; until 1917 territory of Tepic; 10,444 sq. mi.; pop. 170,000; cap. Tepic.
Naz'arene, Church of the. *See in Index* Church of the Nazarene
Nazareth (năz'ă-rêth), Palestine, town 65 mi. n. of Jerusalem; pop. 10,000; much visited by Pilgrims; great Church of the Annunciation; boyhood home of Jesus: P-34.
Nazareth College, at Louisville, Ky.; Roman Catholic, for women, founded 1920; arts and sciences.
Nazareth College, at Rochester, N.Y.; Roman Catholic, for women, founded 1924; arts and sciences.
Naz'arites, name given among the Hebrews to certain men who consecrated themselves to God in accordance with the Law of the Naz'arites given in Numbers vi.
Nazi (nôt'si), popular name of National Socialist Party of Germany G-75, 76-76b, H-311
Nazism, a political doctrine G-76-76a
communism compared with D-67d
form of fascism D-67d, F-18
Hitler exponent of H-311
Nazimova (nă-zē'mô-vă), Alla (born 1879), imotional actress, noted for work in Ibsen's plays; born Russia, made New York debut in 1905 ('A Doll's House'; 'Hedda Gabler').
'NC-4', historic seaplane, picture A-72
Neagh, Lough (lôk nă), largest lake in Ireland, near Belfast, map E-279
Neale, John Mason (1818-66), English divine and scholar; translated ancient and medieval hymns ('Jerusalem the golden'; 'Brief life is here our portion'); founded Anglican sisterhood of St. Margaret; wrote on ecclesiastical subjects.
Neanderthal (nă-ăn'dêr-tăł) man M-46
Neapolis (nē-ăp'ô-lis), ancient Greek settlement on site of Naples N-4
Neap (nēp) tide T-91, diagram T-91
Nearetic, one of the six zoogeographical regions of the world Z-230
Near East, in American usage, term applied to Turkey, Syria, Palestine, Egypt, Iraq, and Persia (Iran), and sometimes Arabia. In British usage this region is usually designated the Middle East, the Near East meaning the Balkan countries
archeological remains A-251, A-254
Near East Relief, an American organization incorporated 1919, to help sufferers in Near East; discontinued 1930. Near East Foundation, Inc., was organized November 1940 to carry on similar work.
Near Islands, westernmost group of Aleutians, map A-105
Near-sightedness, or myopia E-352
spectacles for S-240

Neat's-foot oil L-211
Neb-neb, an African acacia A-4
Nebo, Assyrian god of learning who is said to have invented writing; Mount Nebo named for him.
Nebo, a mountain in Palestine whence Moses saw the Promised Land; perhaps the modern Jebel Neba (2650 ft.) near Dead Sea.
Nebraska, a n. cent. state of the U. S.; 77,237 sq. mi.; pop. 1,315,834; cap. Lincoln: N-57-60, maps N-57, U-188b-c
agriculture N-58
Arbor Day, origin A-247
bird, state B-122
cattle ranges C-108, 115, N-58
cities N-60, list N-57. *See also in Index* names of cities
education N-60: Omaha O-225
flag F-92, color plate F-87
flower, state S-279
forests, national and state, table F-250
history N-60: Kansas-Nebraska Act K-7; Oregon Trail F-16
irrigation N-57-8, I-149
manufacturing N-58
name, origin, nickname N-58, 60
national monuments N-22a, d
natural features N-57: artesian basin A-312
pioneer sod house, picture P-221i
products N-58, 60, list and chart N-57
soil N-58, S-191, picture S-191a
tornado, picture S-299
Nebraska, University of, at Lincoln. Neb.; state control; founded 1869, opened 1871; arts and science, agriculture, business, home economics, dentistry, law, medicine, nursing, pharmacy, teaching, fine arts, music, engineering: picture N-59
Nebraska City, in rich agricultural region of s.e. Neb. on Missouri River; pop. 7339; clothing, cigars, canned fruits and vegetables
early fur post N-60
Nebraska ice sheet I-2b
Nebraska Wesleyan University, at Lincoln, Neb.; organized 1887; liberal arts, music, education.
Nebuchadnezzar (nēb-yū-kăd-nēz'ēr), or Nebuchadrezzar, Babylonian king 604-561 B.C. B-8
builds canal C-67
captures Jerusalem B-8
favors Daniel P-352
Hanging Gardens S-81-2, B-8, picture S-83
Nebula (nēb'yū-lă), in astronomy N-60-1
Andromeda, a galaxy A-346, charts S-275e, f, picture N-61
Orion N-60, chart S-275
Neb'ular hypothesis, theory that solar system condensed from a nebula N-61, P-233, E-128
Necator, genus of nematode worms to which hookworm belongs.
Nech'bet, a culture-goddess worshiped in ancient Egypt.
Neches (nēch'ēs) River, in Texas, rises in n.e. and flows 350 mi. s. to Sabine Lake, map T-56
Necho (nē'kō) II (died 594 B.C.), king of Egypt, ruled 609-594 B.C.; built canal from Nile to Red Sea
Africa circumnavigated A-38
Neck, in anatomy broken, first aid F-65
Neckam, Alexander (1157-1217), English scholar, lecturer at University of Paris, schoolmaster at Dunstable, later abbot of Ciren-ester; wrote treatises on scientific knowledge of time ('De Naturis Rerum' and 'De Utensilibus'); the latter contains first European mention of mariner's magnetic needle.

Fact-Index

A LIST OF NAUTICAL TERMS

- Abaft.** Back of or behind, as abaft the main mast.
- Abeam.** On the beam, or side of a vessel, amidships, or at right angles to the ship's keel.
- Aft or After.** Anything at, near, or toward the ship's stern.
- Amidships.** In the center of the ship.
- Anchor.** A heavy contrivance of iron or steel which holds a vessel in place in emergencies at sea, or when lying in a harbor and not moored to a wharf. The anchor is attached to the bow of the vessel by a hawser or chain fastened to a ring or shackle in its head. The lower end is a crosspiece ending in flukes, and just below the head there is sometimes another crosspiece called the shank.
- Ballast.** Anything used for a weight to keep a ship seaworthy when she is sailing or steaming without cargo; she is then said to be "in ballast."
- Beam.** Timber stretching the width of a vessel to support the deck. Also the width of a vessel at its widest part.
- Bearings.** The directions in which points lie relative to an observer. These directions are given in terms of angle from true north, or from a compass. An object bearing 90° true thus is due east of the observer.
- Bilge.** That part of a vessel's hull between the section of greatest curvature and the keel; usually about halfway between the keel and the water line.
- Bitts.** A post, or usually a pair of posts, fastened to the deck of a vessel for attaching the mooring lines, or towing hawsers; also a support to the windlass.
- Block.** A wooden or iron casing fitted with grooved wheels, through which a rope is passed for ease in hoisting sails, spars, or other heavy objects; a pulley-block; also an incomplete form having holes in it for changing the direction of a rope.
- Bobstay.** A part of the standing rigging of a sailing ship, being the stay which holds the bowsprit down to the stem.
- Boom.** A large round spar used for holding the foot of a fore-and-aft sail, one end being movably fastened to the mast; also a boom for hoisting cargo.
- Bow.** The forward part of a ship, especially that part which curves around to the stem; also called bows.
- Boxing the compass.** Naming the 32 points of the compass from north through east, south, and west again. A method of learning the various points and their relation to all the other points of the compass.
- Brace.** Rope used to move a yard.
- Bridge.** A narrow platform raised above the deck of a vessel and running athwartships for the use of the navigating officers.
- Bulkhead.** A partition in the hull of a ship, running either athwartships or fore and aft.
- Bulwark.** The side of a ship above the main deck, usually topped by a rail.
- Bunker.** That part of a vessel's hull where the coal or other fuel is carried.
- Buntline.** One of the lines fastened to the foot of a sail and used to haul the sail up to the yard.
- Capstan.** A vertical windlass used for hoisting the anchor or heavy sails, and in warping a vessel to her mooring; manned by the crew with capstan bars or operated by steam.
- Centerboard.** A plate or board on a sailboat, pivoted so that it will drop through a well in the bottom of the boat to act as a keel to prevent leeway.
- Chine.** Longitudinal strip of wood lying in the angle between the bottom and side of a flat-bottomed or V-bottomed boat; line of hull along this angle may also be called the chine.
- Cleat.** A timber or iron fitting fastened to the deck of a vessel, with fore-and-aft arms around which a rope may be hitched.
- Clew.** The clew in a square sail is the lower corner; that of a fore-and-aft sail is the after lower corner. The loop and thimbles in the corner of a sail; also to haul up a square sail for furling as, "clew up," or to lower a yard as, "clew down."
- Clinker-built.** A boat built with the planking overlapped.
- Coaming.** A vertical strip around the cockpit of a sailboat to keep out the water; also used around the skylights and hatches of a vessel.
- Cockpit.** A space in small vessels which is lower than the deck, usually aft, equipped with seats and giving easy access to the cabin.
- Cutter.** A boat with a square stern used for carrying passengers and supplies and propelled by oars, sail, or steam; also a sailboat rigged somewhat like a sloop; also a small armed vessel in the United States Coast Guard service.
- Davits.** Vertical metal pillars, with the upper ends bent over, to which a small boat is attached. They turn to allow the boat to be raised from the deck and then swing out clear of the side for the boat to be lowered.
- Dead reckoning.** The deduction, by means of records of courses, time, wind, and distances, of a ship's position. Plotted on a chart or sailing sheet, the dot representing the estimated position is marked "Est." or "D.R."
- Dinghy.** A small rowboat used as a tender.
- Ephemeris.** A book of tables showing position of various stars for each day of the year. Used by astronomers and navigators. 'The American Ephemeris and Practical Navigator' is published for navigators.
- Fall.** The part of a hoisting rope which hangs from a block or pulley, to which the power is applied; the tackle on the davits by which the boat is lowered; boat-falls.
- Falling off.** When a vessel's bow drops away to leeward of her course.
- Forecastle.** The forward part of the hull under the main or weather deck, usually fitted with bunks for the crew.
- Freeboard.** That part of a ship's side measured vertically between the bulwarks and the water line when she is loaded.
- Furl.** To wrap a sail tightly on the yard, stay, or mast.
- Galley.** The ship's kitchen.
- Gangway.** An opening in the bulwarks of a vessel to allow people to enter and leave it.
- Gasket.** A tapered line on a yard or sail for use in making the sails fast when they are furled.
- Gunwale.** The upper line of planks or plates just below the bulwarks.
- Halyard.** A rope for hoisting a sail, or yard, etc.
- Hatch.** An opening in the deck of a vessel through which cargo is loaded and discharged.
- Hawser.** A large cable or rope used for mooring, towing, etc.
- Heave to.** To stop a vessel's headway, usually by bringing her "head on" into the wind.
- Heeled over.** Said of a sailing ship when she is running close-hauled to the wind which causes her to lay over at an angle.
- Helm.** The steering apparatus of a vessel, made up of the rudder, tiller, wheel, and tiller ropes.
- Hold.** The main cargo space below the lowest deck.
- Keel.** A timber or series of plates running the length of the bottom of a vessel from stem to stern on the center line, to which the ribs are attached.
- Keelson.** A beam extending over the keel to strengthen it.
- Larboard.** On the left side of a vessel; same as "port."
- Leeward.** The opposite side to that from which the wind blows.
- Leeway.** The sidewise motion of a ship caused by pressure of wind. Must be allowed for in setting accurate sailing courses.
- Luff.** To turn the head of a sailing ship nearer the wind.
- Marline.** A small rope or cord of two strands, usually tarred, used for "whipping" or winding the ends of large ropes or cables.
- Marlinespike.** A tapered iron pin used for spreading the strands of a cable in making a splice.
- Martingale.** A stay used to hold down the jib boom or the flying jib boom.
- Painter.** Rope, usually at the bow, for making a boat fast.
- Poop.** A raised deck at the stern of a vessel, above the spar deck; also said of the entire stern of the vessel.
- Port.** The left-hand side of the ship as seen when looking forward; also a porthole or circular opening in the side of a ship.
- Quarter-deck.** A part of the weather deck reserved for the officers of the vessel, usually extending aft from the mainmast and frequently including the poop deck.
- Ratline.** A small rope fastened between a vessel's shrouds to form the rungs of a ladder.
- Reef.** To shorten the sail by folding or tying a portion of it around a yard or boom.
- Scuppers.** Holes in the side of a vessel at the deck level for draining the water from the deck.
- Sea anchor.** A drag made of broken spars or other timbers lashed together and thrown overboard to the windward of a disabled vessel to prevent her making leeway while riding out a storm.
- Shackle.** A link used to lock a porthole, or to fasten a block to an eyebolt, or the like.
- Sheet.** A rope attached to a sail to regulate its angle to the wind; also the open spaces between the thwarts and the ends of a small boat as the fore-sheets and sternsheets.

(Continued on the next page)

A LIST OF NAUTICAL TERMS—Continued

Shrouds. Part of the standing rigging, consisting of two or more ropes, usually wire, from the masthead to the gunwale of a ship; they are generally fitted with ratlines making a rope ladder.

Spar. Term applied to any mast, yard, or boom used to support a sail.

Sprit. A small spar extending diagonally from the mast to the aft upper corner of a fore-and-aft sail to extend it. The sail is then called a spritsail.

Stanchion. A post or pillar placed upright in a ship.

Starboard. The opposite of port. The right-hand side of a ship when looking forward.

Stay. A rope used in tension to brace a mast or yard.

Stem. Extreme forward timber in a vessel to which the sides are joined.

Stern. The after end of a vessel.

Strake. One continuous line of planking or plates on a vessel's bottom or sides.

Taffrail. The railing placed around the stern of a ship.

Top. A platform at the foot of each topmast on a sailing ship. Like the crossrees, it anchors and spreads the shrouds. The tops are called foretop, maintop, and mizzen-top.

Transom. Board forming stern of small boat; also a seat at side of cabin with lockers beneath.

Waist. That section of the vessel between the quarter-deck and the fore-castle; the central portion of the ship.

Warping. When a vessel is shifted from one position to another by means of a cable around a snubbing post or piling she is said to have been warped to her new berth.

Watches. The division of the crew of a vessel for deck duty, usually called port and starboard watches, which are

on duty alternately; also the period into which the day is divided, usually of four hours each. The watches are: first watch, 8 p.m. to midnight; mid-watch or middle watch, midnight to 4 a.m.; morning watch, 4 a.m. to 8 a.m.; forenoon watch, 8 a.m. to noon; afternoon watch, noon to 4 p.m.; first dogwatch, 4 p.m. to 6 p.m.; second dogwatch, 6 p.m. to 8 p.m. The dog-watches alternate the periods when the port and starboard watches are on duty.

Weather deck. A deck with no covering overhead, therefore exposed to the weather.

Whaleboat. A ship's rowboat sharp at both ends. Originally used on whalers but now carried by many large vessels.

Windward. The direction from which the wind is blowing.

Yard. A spar set athwartships on which a sail is bent.

Neck'ar River, Germany, tributary of Rhine rising in Black Forest, entering main stream at Mannheim B-153, map G-66
Heidelberg on H-270

Necker (*nēk'ēr*, French *nē-kēr'*), Jacques (1732-1804), French financier; born Genève, Switzerland; father of Mme. de Staël; director-general of French finances under Louis XVI: F-201

opposed by Marie Antoinette M-64
Necklace G-25, color plate G-27a-b

Nec'romancer, one who claims to have magic power through communion with the dead (from Greek words for corpse and divination) M-32

Necrop'olis, term meaning "city of the dead," applying to cemeteries in vicinity of ancient cities, particularly to suburb of Alexandria, where corpses were embalmed.

Nectar (*nēk'tār*), the sweet liquid found in many flowers
bees turn to honey B-74, picture B-75
bumblebee gathering, color plate B-76a

Nectar, in Greek mythology, the drink of the gods. See also in Index Ambrosia

Nec'tarine, a variety of peach (*Prunus persica*); smooth, waxy skin and firm, aromatic pulp; grown either from seed or by grafting; cultivated principally in California.

Needham, Mass., town 12 mi. s.w. of Boston, chiefly residential; pop. 12,445; knit goods.

Needle, photograph P-176

Needle, sewing N-61-2

Stone Age, picture S-293

Needlefishes, excellent food fishes (*Betonidae*), found in all warm seas; silvery green in color, including the bones; bodies long and powerful with tapered jaws.

Needle-gun F-50, picture F-49

Needlepoint lace L-47-8, picture L-49

Needles, rock formations in Black Hills, picture S-219

Needlework. See in Index Embroidery; Sewing

Neenah, Wis., city on Fox River, 30 mi. n. of Fond du Lac; pop. 10,645; paper, veneer and doors, knitting mills: map W-124

Neerwinden (*nā'vīn-dēn*), Belgium, village 30 mi. e. of Brussels where French defeated English 1693, and

Austrians defeated French 1793; occupied by Germans 1914 and 1940.

Nefertiti (*nē-fēr-tē'tē*), also Nofretete, queen of Ikhenaton, picture A-250

Nefud Desert, Arabia A-237, map A-242

Negapatam (*nē-gā'pā-tūm*), port of s.e. India; pop. 49,000; trade with East Indies; point for coolie emigration; vegetable oils, rice.

Negative, photographic P-182-4, pictures P-181
motion picture M-280; developing, picture M-286

Negative acceleration, in physics P-191

Negative bias, in radio R-21, diagram R-25

Negative electricity E-220, 221

Negative number A-286

Negative pole, of magnet E-227

Negotiable paper, or negotiable instruments, notes, bills, contracts, or documents, which can be endorsed and transferred to third party. Common negotiable instruments are checks, bonds, banknotes, bills of exchange, and promissory notes: C-393-4

Negri (*nā'grē*), Ada (born 1870), Italian poet; her poems show great sympathy for the working class ('Tempeste'; 'Maternità').

Negrillo (*nē-grī'lō*), pigmy P-218. See also in Index Pigmy

Negri Sembilan (*nā'grē sēm-bē-lān'*), one of the Federated Malay States, bordering Strait of Malacca; 2580 sq. mi.; pop. 275,000; largely agricultural; exports tin: M-43

Negrilo (*nē-grē'lō*), pigmy P-218. See also in Index Pigmy

Negro N-62-3, Outline R-12. See also in Index Slavery

Africa A-39, 34, S-200, pictures A-34, 38, 39, 40, R-11, S-203

Barbados B-45

Brazil B-225, 226c

"bush Negroes" of Guiana G-183

Central America C-133

East Indies E-142b-c

hair H-196

Haiti H-197, 198

Jamaica population J-182

Latin America L-67e

Liberia L-100-1

Nova Scotia population N-180

numbers P-304d: Africa A-39; United States N-62

racial affinity, diagram R-9b

United States N-62-3
amendments to Constitution C-257
cities N-62

civil and legal rights affected by Constitutional amendments U-210

education N-62-3: Alabama A-98d-e; Arkansas A-296, 298;

Florida F-116; Tennessee T-46; Texas T-59; Virginia V-307;

Washington, D.C. W-27; Booker T. Washington W-12, H-251

Fair Employment Practices Committee N-12r

folk-tales and songs F-135, S-303l

music M-316
philanthropy and charity P-161,

N-63, H-250
reconstruction period C-257

sculpture S-64
slavery S-161, W-72e-f

suffrage S-319
West Indies W-72e-f, pictures W-72d

Negro Agricultural and Technical College, at Greensboro, N.C.; state institution founded 1891; agricultural and mechanic arts, science, education, trade.

Ne'groid, racial type resembling Negro N-62

pigmy types P-218

Negro Mountain, highest point in Pennsylvania, in Somerset County (3213 ft.).

Negroponte (*nēg-rō-pōn'tā*), island of Greece. See in Index Evvoia

Negro River. See in Index Rio Negro

Negro Rural School Fund, founded 1907 by a bequest of \$1,000,000 from Anna Thomas Jeanes for improving the elementary education of Negroes in the Southern States of the U.S. See also in Index Southern Education Foundation, Inc.

Negros (*nā'grōs*), fourth largest island of Philippines, near center of group; 4903 sq. mi.: maps A-332c, P-10b

Ne'gus Ne'gusti, title of Ethiopian emperor E-307

Nehantic. See in Index Niantic

Nehemiah (*nē-hē-mī'ā*) (5th century B.C.), governor of Judea under Artaxerxes; restored walls of Jerusalem, relieved condition of poor and reestablished temple service: J-217

Nehemiah, Book of, book of the Old Testament largely written by

- Nehemiah; recounts the events of his rule.
- Nehru (*nā'ru*), Pandit Jawaharlal (born 1889), Indian Nationalist leader, born Allahabad, India; son of Pandit Motilal Nehru; friend of Gandhi, although often differs with him on political questions; imprisoned several times; from 1929-40, alternately president (three times) and secretary of Indian National Congress, succeeded Gandhi as leader January 1942; a socialist, emphasizing economic needs of India (autobiography, 'Toward Freedom').
- Nehru, Pandit Motilal (born 1861), Hindu Swarajist leader; founded *Independent*, extreme Nationalist paper; sacrificed lucrative legal practise to support actively Gandhi's non-coöperation campaign; chairman National Congress party.
- Neighborhood Guild, social settlement in New York City S-181
- Neihardt, John Gneisenau (born 1881), American poet, born Sharpsburg, Ill.; appointed poet laureate of Nebraska; lived among Omaha Indians, studying them and their folk-lore; worked for years on epic cycle of American pioneer life ('The River and I'; 'The Song of Three Friends'; 'Indian Tales').
- Nellson, (Lillian) Adelaide (1846-80), English actress famed in both America and England for Shakespearean rôles.
- Neith (*nā'ith*), in Egyptian mythology, goddess of the hunt and armed protection, *picture* E-200
- Nejd (*nējd*), the larger part of Kingdom of Saudi Arabia; formerly part of dual state of Hejaz and Nejd; chief cities Riyadh and Hofuf; pop. over 3,000,000; A-237, *map* A-242 flag F-96, *color plate* F-89 Ibn Saud's rule A-240-1
- Nekrasov (*nyē-kra'sōf*), Nikolai Alexejevich (1821-77), Russian poet; beloved by common people whose daily lives he described; published, at different times, two radical periodicals ('Who Can Be Happy and Free in Russia?').
- Nek'ton, form of marine life O-200
- Nelligan (*nēl-ē-gūn*), Emile (1882-1942), French-Canadian poet C-66
- Nelson, Donald Marr (born 1888), merchant, public official, born Hannibal, Mo.; with Sears, Roebuck & Co. since 1912, vice-president 1930-42; became director of purchases for national defense 1940 and chief of the War Production Board 1942; N-12f, *picture* N-12p
- Nelson, Horatio (1758-1805), English naval commander N-63-4 Copenhagen, battle of N-63, B-32 monument, *pictures* L-186, I-127 Nile, battle of N-63 tomb in St. Paul's L-186 Trafalgar, battle of N-63-4, N-56d
- Nelson, Knute (1843-1923), American statesman, born Evanger, Norway; came to U. S. with mother in 1849; with Wisconsin regiment in Civil War; moved to Minnesota 1871; congressman 1882-88; governor 1892-95; U. S. senator 1895-1923; liberal Republican; was author of bankruptcy act (1898), Dept. of Commerce act (1902); called "grand old man of Minnesota."
- Nelson, Thomas (1738-89), signer of Declaration of Independence; born Yorktown, Va.; governor of Virginia (1781); gave fortune for equipping troops during Revolution and other public expenses.
- Nelson, William Rockhill (1841-1915), American journalist, born Fort Wayne, Ind.; founder (with S. E. Morss) of Kansas City *Star*, which under his editorial policy ("independent, but never neutral") exerted considerable influence; left greater part of his wealth for erection of art museum in Kansas City.
- Nelson, British Columbia, Canada, city in s.e. on arm of Kootenay Lake; pop. 5992; center of the mining, lumbering, and fruit-growing Kootenay district: *map* C-50b
- Nelson monument, London, *picture* L-186
- Nelson River, Canada, outlet of Lake Winnipeg in Manitoba; flows 400 mi. n.e. to Hudson Bay; including headstreams, Saskatchewan and Bow, length 1600 mi.: C-52, *map* C-50b-c
- Nelum'bo, American lotus, water chinquapin, or yellow water lily L-199, *pictures* L-199, B-204
- Nemathelminthes (*nēm-ā-thēl-min'-thēs*), a phylum of invertebrate animals, comprising the nematodes and other roundworms: Z-227
- Nemato'da, group of unsegmented worms of phylum Nemathelminthes, including many parasites in bodies of man, animals, and in plants.
- Nemean, (*nē-mē'an*) Games, ancient Greek athletic and musical festivals held in valley of Argolis in midsummer every two years in honor of Nemean Zeus; date from 516 B.C.
- Nemean lion, in Greek mythology, monster slain by Hercules H-232
- Nemesia (*nē-mē'shi-ā*), a genus of annual and perennial African plants, of the figwort family. Low, erect growing with narrow, toothed leaves; flowers snapdragon-shaped but orchid-like in beauty, ranging in color from white through purple with contrasting shades in throat of blossom.
- Nem'esis, in Greek mythology, goddess of justice N-64
- Nemi (*nā'mē*), Lake, Italy, in Alban Mts., 18 mi. s.e. of Rome, in crater of extinct volcano; in ancient times called "Mirror of Diana" and famous for beauty and for temple of Diana on its shores. Two pleasure barges built by Emperor Caligula were uncovered in 1928-30 when the lake was drained.
- Nemiskam National Park, Alberta, Canada N-23
- Nē'mo, Captain, character in novel by Jules Verne S-311, 312
- Nemophila (*nē-mōf'i-lā*) a genus of dwarf spreading annual plants of the water-leaf family (*Hydrophyllaceae*) with delicate white or purple spotted blue flowers; among the species cultivated as garden plants are the five-spot (*Nemophila maculata*), baby blue-eyes (*Nemophila menziesii*), and the climbing nemophila or fiesta-flower (*Nemophila awrita*).
- Nemunas River. *See in Index* Niemen River
- Nen'nus (flourished 796), Welsh monk and historian, lived in Mercia 'Historia Britonum' A-316
- Neodym'ium, chemical element C-168
- Neolithic Age, or New Stone Age M-46, 47, 48, S-293, *pictures* C-119, M-47, *color plate* M-48c-d
- Nē'on, an inert, rare gaseous element, forming one-thousandth of one percent of air; obtained by distilling liquid air: C-175, 168
- atomic structure A-361, *diagram* A-360 electric signs and lights E-238: glow, how produced E-243
- isotopes C-169
- lightness, comparative G-18
- Neo-Pla'tonism, a revival of Platonic philosophy, mixed with the pantheistic religion of the Orient; originated in Alexandria, Egypt, in the 3d century.
- Neoprene, rubber-like material R-169a
- Neoptolemus (*nē-ōp-tōl'ē-mūs*), in Greek mythology son of Achilles; entered Troy in the wooden horse; slew Priam king of Troy; also called Pyrrhus.
- Nē'o'sho River, in Kansas and Oklahoma; flows 350 mi. to the Arkansas: *map* K-4
- Neotrop'ical region, one of the six great zoogeographical divisions of the world Z-230
- NEP, popular name for Russia's new economic policy R-190-2
- Nepal (*nē-pāl*'), an independent kingdom between n.e. India and Tibet, on s. side of Himalayas; 54,000 sq. mi.; foreigners rarely allowed to enter; pop. 5,600,000; cap. Katmandu: I-30, *maps* I-30, A-332c capturing rhinoceroses in Z-219-20 flag F-96, *color plate* F-89 Mt. Everest E-339-40
- Nepen'thes, or nepenthe, mythical Egyptian drug producing forgetfulness of pain and trouble; referred to in the 'Odyssey'.
- Nepenthes, pitcher plant genus P-223
- Nepeta, a genus of plants of mint family, includes the catnip and ground ivy.
- Neph'oscope, instrument used in weather reporting to determine the direction, velocity, and angular elevation of clouds.
- Neph'rite, a somewhat common variety of jade, occurring in Turkestan, New Zealand, Siberia, and Alaska; colors range from white to dark green: G-23
- Nepos (*nē'pōs*), Cornelius (99?-24 B.C.), Roman historian ('De viris illustribus', much used as school text).
- Nep'otism (from *nepos*, Latin for nephew), practise of rulers or state executives who give official positions to relatives.
- Nep'tune, in Roman mythology, sea-god corresponding to Greek Poseidon P-315. *See also in Index* Poseidon
- Neptune, planet P-230, 233, N-64, *diagrams* P-230, 231, 233, *table* P-231 discovery A-349-50 satellites P-233
- Nerbudda River. *See in Index* Narbada River
- Nereids (*nē'rē-idz*), in Greek mythology, sea-nymphs N-188 Calypso O-205 Poseidon attended by P-315 Thetis, mother of Achilles A-8-9
- Nereus (*nē'rē-ūs*), in Greek mythology, a minor sea-god, father of the Nereids; sometimes called "the old man of the sea"; after changing his form in turn to fire, lion, water, and smoke in effort to escape from Hercules, he guided him to the Garden of the Hesperides.
- Nernst (*nērnst*), Walter (1864-1941), German physical chemist; professor physics Göttingen University and University of Berlin; director chemical institute, Berlin; invented Nernst incandescent lamp in 1897; won Nobel prize in physics, 1920.
- Nē'ro (37-68 A.D.), Roman emperor N-64 poisons guests with mushrooms M-306

persecutes Christians N-64
removes statues from Delphi D-44
roses at feasts R-156
statue in Capitoline museum R-138
Ner'va (32-98 A.D.), Roman emperor
(96-98 A.D.); poetic and kindly;
liberal and just administrator;
adopted Trajan as colleague and
successor.

Nerve-blocking, a mode of producing
anesthesia A-197

Nerves N-64-5, *pictographs* N-64a, b.
See also in Index Brain
afferent, or sensory N-65

auditory E-126, *diagram* E-127
cells B-220, 222; ganglia P-207
condition in: hypnosis H-378; sleep
S-163

effect of: narcotics N-12; poisons
P-275

efferent, or motor N-65; termination
in muscle, *picture* M-305

fibers B-220, 222-3, N-65
heart H-259

olfactory (smell) S-164
optic E-350, *diagram* E-349, *picto-*
graph N-64b

plexuses of P-207
reflex reactions R-63-4, B-221-2, 223,
pictographs N-64a, b

respiratory center R-80
sympathetic P-207, N-65

taste, *picture* T-107
teeth T-28, *picture* T-29

touch T-116-17
vitamin B₁ protects V-310-11

Ner'vo, Amado (1870-1919), Mexican
poet L-67j, w

Nervous system, in anatomy, the
complete system of nerve cells and
nerve fibers, *pictographs* N-64a, b

cerebro-spinal P-207, N-65; brain
B-219-223; spinal cord B-219

sympathetic, or autonomic P-207,
N-65

Nervures, veins or ribs in the wings
of insects, *picture* F-129

Ness, Loch, lake in Scotland; 23 mi.
long, average width one mile; dis-
charges into Moray Firth by River
Ness, 8 mi. long; *map* E-270a

Caledonian canal S-44

Nes'sus, in Greek and Roman
mythology, centaur slain by Her-
cules H-283

Nest

alligator A-129

birds B-125-6, 141, *pictures* B-124,
127. *See also in Index* Birds, sub-
head nests; also names of birds

duckbill D-118

fish F-71: stickleback S-289; sunfish
S-330

insects I-86

ant A-213, *picture* A-212

carpenter bee, *picture* B-77

leaf-cutter bee B-78

mole cricket, *picture* C-397

termite, *picture* T-52b

tumble-bug B-83

wasps and hornets W-32-5, *picto-*
graphs W-33, P-57

orang-utan O-240

rabbit, *picture* N-37

spider S-254

turtle T-166

Nes'tor, in the *Iliad*, wise old war-
rior and counselor of Greeks in
the Trojan War (the "Nestor" of
an organization or group means the
oldest member): T-142-3

Nesto'rians, Christian sect named
after Nestorius (died about 440),
patriarch of Constantinople; cen-
tered in Persia; "catholicus" or
chief bishop had seat at Baghdad
from 762 to 1258; in 6th and 7th
centuries spread over much of
Asia, evangelizing India and China;
there are still a number of adher-
ents in Turkey and Persia.

"Nestor of the Rockies," Kit Carson
C-87-8

Netherlands Guiana. *See in Index*
Dutch Guiana

Netherlands, Kingdom of (Holland),
in n.w. Europe; 13,000 sq. mi.;
pop. 7,920,000; cap. Amsterdam:

N-66-75, H-323, *maps* B-87,
E-326c, d, f, *Outline* N-74-5

agriculture N-68

bibliography N-75

book trade, medieval B-180

bulb growing: hyacinths H-364;
tulips T-149, N-68, 69, *picture* N-69

Christmas C-229a-b, 228

cities N-68-9, list N-66. *See also in*
Index names of cities

colonies N-66: Netherlands Indies
E-142c, B-197-8; Guiana G-182-3

commerce N-66, 68, R-159, *table*
C-480: Java J-204-5; per capita
foreign trade I-110a, *pictograph*
I-110e

costume N-66, *pictures* N-67, 68, 71,
73, F-133, M-154a, M-317, P-19,
P-210

customs: Christmas C-229a, *picture*
C-226; pictured in 'Hans Brinker'
L-162

dairying N-68, D-5: cheeses C-164

Delft P-332, 331, *picture* P-335

dikes and canals I-147, N-66, 69, *pict-*
ures N-70, E-319

education N-71, 74: illiteracy P-304d

flag F-96, *color plate* F-89

flood control N-66, 69, F-106d, *pict-*
ures N-70, 71, E-319

folk-dance, *picture* F-133

government N-73

history N-72-3, *Outline* N-74

under Charles the Bold C-153

printing introduced P-347

struggle for independence N-72:
story N-73-4; William the Silent
W-103; 'Surrender of Breda,' *pict-*
ure P-18

early spice trade S-249, E-142f:

Malay Peninsula M-43

conquest of East Indies E-142f

English break naval power B-155

Pilgrims in M-92

American colonies A-146: Connecti-
cut C-339; Delaware D-40, 40b,
41, 42; New Amsterdam N-121;

New Jersey N-92; Pennsylvania
P-116; causes of failure A-155-6;

education E-176

wars with Louis XIV L-201-2,
W-103

American Revolution R-88

Louis Bonaparte, king B-171, N-73

loses colonies in South Africa S-200

gains Sumatra S-325

Congress of Vienna and union with
Belgium N-73

Scheldt River controversy S-38

effects of 1st World War N-73

German invasion N-73, W-178h-4

illiteracy P-304d

language and literature N-72

manufactures N-68, A-189

national songs N-26

natural features N-66, *Outline* N-74

painting N-71, P-16, 18, 21, *Outline*
P-30, 31

population density N-70

postal service, *picture* P-316

products, list N-66, *pictograph*
E-322b

puppets, favorite character P-368b

rivers N-66: Maas (Meuse) M-131;

Rhine R-93; Scheldt S-38

shelter N-66, 70, A-189, *pictures*

N-66, 68, 70: interior, *picture* N-67

ships: merchantman of 1650, *picture*

S-125; tonnage S-129

stories: 'Hans and the Dike' N-72;

'How the Ocean Saved Leyden
from the Spaniards' N-73-4

transportation N-70

windmills W-111, *pictures* N-66, 70,
73

woman suffrage W-133

Netherlands Indies, or Dutch East
Indies, territory in Malay Archi-
pelago subject to Netherlands; cap.
Batavia; includes Sumatra, Java,
part of Borneo and New Guinea.

Celebes, Moluccas; over 735,000
sq. mi.; pop. 70,000,000: E-142c-43,
maps E-142-142a, A-332c, P-10b.

See also in Index East Indies, and
names of chief islands

Japanese in W-178l, x, E-143

Krakatoa Park N-23

Netherlands West Indies. *See in Index*
Dutch West Indies

Nethersole, Olga (born 1870), Eng-
lish actress; for 25 years played
emotional rôles, chiefly Sapho.

Camille, and Paula Tanqueray, ap-
pearing in France, America, and
Australia; managed several London
theaters; during 1st World War a
Red Cross worker.

Néthou (nā-tg'), Pic de or Aneto, Pic
de, highest mountain of the Pyrenees
(11,168 ft.), in Spain, about 50 mi.
w. of Andorra.

Net price system, in bookselling
B-190-1

Nets, fish F-80, 81, *pictures* F-78, 79,
80, 81, W-31

Netsuke (nēt'sy-kā, or nā'tsy-kā),
Japanese carving J-200

Netted melon, or nutmeg melon M-112

Nettle, a plant of the nettle family,
although name is often applied to
any plant with stinging hairs.

Nettle family, or Urticaceae (from
Latin word, to burn), family of
plants, shrubs, and trees some of
which have stinging hairs. These
hairs are sharp-pointed tubes con-
taining formic acid, the same poison
as in the sting of an ant; they break
off in the skin and cause irritation
and welts. Family includes mem-
bers of genus *Parietaria*, source of
nitre used in drugs; also genus
Boehmeria, from which comes
China grass or ramie used in mak-
ing textiles.

Nettle-tree. *See in Index* Hackberry

Net tonnage, of ships S-130

Networks, broadcasting R-30, 31a

Neuchâtel (nā-shā-tēl'), city, rail-
road and industrial center in w.
Switzerland on Lake Neuchâtel;
pop. 23,000; watches and clocks;
university.

Neuchâtel, lake in w. Switzerland, 18
mi. n. of Lake Geneva; 93 sq. mi.;
traversed by river Thièle

lake dwellers, *color plate* M-48c-d

Neuilly (nā-yē'), or Neuilly-sur-Seine
(sūr sēn), France, manufacturing
and residential town, suburb of
Paris, on Seine River; pop. 57,000;

location of American army hospital
during 1st World War.

Neuilly, Treaty of (1919), between
Allied Powers and Bulgaria, signed
at Neuilly, France, by which Bul-
garia lost her conquests of Balkan
War (1912-13) and of 1st World
War to Rumania, Yugoslavia and
Greece: W-174, E-271

Neu-Kölln (noi'kāl'n), Germany, a
suburb of Berlin; pop. 267,000.

Neumann (noi'män), Alfred (born
1895), German writer, best known
for historical novels and plays
(*'The Devil'*; *'The Rebels'*; *'Guer-*
ra'; *'The Patriot'*, a play).

Neumann, John N. (1811-60), Roman
Catholic prelate, born Prachatitz,
Bohemia; missionary worker in w.
New York (1836-40), as far west
as Ohio (1842-44); appointed vice-
provincial of Redemptorist order
1847; bishop of Philadelphia 1852.

Neumes, in musical notation M-318

Neurath (*noi'rät*), Otto (born 1882), Austrian social scientist, born in Vienna; originator of an international picture language of symbols called *isotypes* ('Basic by Isotype'; editor 'International Encyclopedia of Unified Science') examples of isotype pictographs G-136a-e

Neurology, science of the nerves and their diseases.

Neurons nerve cells B-220, 222-3

Neurop'tera, an order of four-winged insects including the lacewing flies and the ant-lions; wings are membranous and net-veined.

Neusatz. *See in Index* Novi Sad

Neuse (*nūs*), a river of North Carolina, 300 mi. long, map N-156

Neutra, Richard J. (born 1892), architect and expert in housing and city planning, born Vienna, Austria; removed to U.S. 1925; advocate of functionalism in architecture.

Neutral colors C-308b, d-e

Neutral equilibrium. *See in Index* Equilibrium, in physics

Neutral ground, Gibraltar G-86

Neutral'ity, in international law I-109-10, N-75-75b

ancient and medieval policy N-75

Dardanelles zoned D-15

embargo acts E-258

league of 1812 W-8, 9

Napoleon's Continental system N-10

Non-Intercourse Act W-9

Orders in Council W-8-9

Switzerland guaranteed S-348

Tangier, international zone T-8

United States policy N-75-75b

War of 1812 W-8, 9

Washington's policy W-20, N-75

Wilson's policy N-75a-b, W-108-9

World War (1st) W-108-9: Belgium

W-151-2; England "rations" neutrals

W-158; neutral ships

W-168-8, N-75a

World War (2d) W-178f: United

States N-75b, R-146m

Neutrality Act of 1939 (United States)

N-75b

Neutralization, of acid or alkali A-9

Neutrino, particle of matter A-362

Neutron, in physics A-360, 362, P-195

isotopes C-169

Nouve-Chapelle (*nūv shā-pēl'*), French

village, 25 mi. s. of Ypres; in battle

there, March 10-12, 1915, British

took a few miles of territory at ter-

rific cost; taken by Germans 1940.

Nevada (*nē-vā'dā*), state in w. U. S.;

110,540 sq. mi.; pop. 110,247; capital

Carson City: N-76-80, maps

N-77, U-188b

antiquities A-148

bird, state B-122

Boulder Dam C-315

cities N-77, list N-76. *See also in*

Index names of cities

flag F-92, color plate F-87

flower, state S-4

forests, national and state, table

F-250

history N-78

Indian reservations and tribes N-77

Lahontan Dam, picture I-149

Lehman Caves N-22b

minerals N-77: Comstock Lode

N-77, 78, S-150, 152; copper C-359;

opal G-29

name, origin of, and nickname S-279

natural features N-76: Great Basin

U-182

products N-76-7, chart N-77, list

N-76

story, 'The Dream of Chief Winne-

mucka' N-79-80

Nevada, University of, at Reno, Nev.;

state control; founded 1873 (at

Elko), opened at Reno 1886; arts

and science, engineering, domestic science, agriculture; normal school Mackay School of Mines, picture N-78

Ne'va River, in n.w. Russia; flows 40 mi. from Lake Ladoga to Gulf of Finland 10 mi. below Leningrad; connected by canal with Volga system: L-53

Leningrad on L-94, 95, 96

Nevers (*nū-vēr'*), France, manufacturing town 140 mi. s.e. of Paris; pop. 34,000; fine cathedral.

Neville (*nēv'il*), great English family; the most famous member was Warwick, "the Kingmaker" (Richard Neville). *See in Index* Warwick

Neville, Wendell Cushing (1870-1930), American army officer, born Portsmouth, Va.; served in Spanish-American War, in Boxer Campaign in China, at Vera Cruz, Mexico, and in the Philippines; commanded 4th brigade in France in 1st World War; rose to rank of major general 1920; commandant marine corps 1929-30.

Nevin (*nēv'in*), Arthur Finley (1871-1943), American composer, brother of Ethelbert; lived for time among Blackfeet Indians and used Indian themes in his music ('Poia'; 'The Daughter of the Forest'; 'Lorna Doone').

Nevin, Ethelbert Woodbridge (1862-1901), American composer, born Edgeworth, Pa.; studied in Germany, and traveled widely; his piano pieces and songs, many of them very lyrical and sentimental, achieved great popularity ('Narcissus'; 'The Rosary'; 'A Day in Venice'; 'Barchetta'; 'The Quest').

Nevins, Allan (born 1890), educator and writer; professor of history at Columbia University; Pulitzer prize (1933) for biography of Grover Cleveland and again 1937 for life of Hamilton Fish. 'The Gateway to History' is a stimulating guide to the reading of history.

Nevinson, Christopher Richard Wynne (born 1889), English artist of modernist school; shows original technique in abstract painting; official artist during 1st World War.

Nevis, island of British West Indies, one of Leeward Islands; 50 sq. mi.; pop. 14,000; birthplace of Alexander Hamilton.

Nevis, Ben, highest peak in Scotland (4406 ft.), map E-279, picture S-45

Nevsky Prospekt, famous avenue in Leningrad L-95

New, Harry S. (1858-1937), U. S. postmaster general 1923-29; born Indianapolis; newspaper man for 25 years; U. S. senator 1917-23; on Republican National Committee 1900-12.

New Albany, Ind., industrial and trade city nearly opposite Louisville, Ky., on Ohio River; pop. 25,414; extensive water power; furniture, plywood, stoves, boats, leather, fertilizer; national cemetery: map I-46

New Amsterdam, name of New York City under Dutch rule N-121, N-133

glass industry G-106

Stuyvesant governor S-310-11

Newark (*nū'ark*), or Newark-on-Trent, England, old town 65 mi. s.e. of Manchester; pop. 17,000; gave name to Newark, N. J.

Newark, Del., town 12 mi. s.w. of Wilmington; pop. 4502: D-40d

Newark, N. J., largest city or state; pop. 429,760: N-80, map N-90

button manufacturing center B-288 statue of Lincoln, picture S-63

Newark, Ohio, industrial city 30 mi. e. of Columbus, on Licking River; pop. 31,487; railroad repair shops and oil refineries; stoves, glass products, lighting fixtures, tires; Buckeye Lake: map O-210

Indian mounds M-291

Newark College of Engineering, at Newark, N.J.; founded 1881; state and city controlled; engineering, industrial chemistry.

New Bahama Channel. *See in Index* Florida Straits

New Bedford, Mass., manufacturing city on Buzzards Bay; pop. 110,341: N-80-1, map M-82

New Bern, N. C., port on Neuse River, near its mouth; pop. 11,815; poultry- and hog-raising; lumber, cotton oil, veneer and boxes, fertilizer; captured by General Burnside, 1862 settlement N-159

Newberry Library, Chicago, reference library; general collections in fields of history, literature, philology, music, and genealogy, C-196, L-106j

Newbery, John (1713-67), English publisher, associated with Dr. Johnson and Goldsmith L-157-8 prints first Mother Goose M-272, L-187

Newbery award (established by Frederic G. Melcher), for best children's book L-158

Newbold, Charles, American inventor cast-iron plow A-49

Newbolt, Sir Henry John (1862-1938), English writer; lawyer 1887-99; won literary fame with martial ballads 'Admirals All' (1897); controller of wireless and cables in 1st World War; knighted 1915 ('The Old Country'; novel; 'Drake's Drum and Other Sea Songs'; 'Naval History of the Great War').

New Britain, largest island in Bismarck Archipelago; 14,600 sq. mi.; pop. 100,000; formerly called New Pomerania; mountainous and volcanic: N-85, map P-10b

2d World War W-179

New Britain, Conn., manufacturing city in s. cent. 9 mi. s.w. of Hartford; pop. 68,685; hardware; state teachers college: map C-336

New Brunswick, a maritime province of Canada; 27,985 sq. mi.; pop. 408,219; cap. Fredericton: N-81, map C-50c

Bay of Fundy T-91, picture T-92

Fort Beauséjour N-22f

joins Dominion of Canada C-60

logging, picture C-54

Maine boundary dispute M-40

Saint John S-7

New Brunswick, N. J., manufacturing and trade city on Raritan River 27 mi. s.w. of New York City; pop. 33,180; automobile trucks, surgical and medical supplies, cigars and cigar boxes; Rutgers University; occupied by British 1776-77: map N-90

New Brunswick, University of, at Fredericton, New Brunswick; non-sectarian; founded 1800 (college of New Brunswick, reorganized as university 1859); arts and science, civil engineering, electrical engineering, forestry, law.

Newburgh, N. Y., city on Hudson River 55 mi. above New York City; pop. 31,883; important trading and shipping point before Revolution; Hasbrouck Mansion was Washington's headquarters; trade center for coal, fruit, dairy, and farm products; textiles, carpets, foundry and paper products: map N-114

Newbury, Mass., flag F-98, color plate F-90
 Newburyport, Mass., city on Merrimack River 3 mi. from sea and 30 mi. n.e. of Boston; pop. 13,916; shoes, silverware, electrical goods; settled about 1635; famous for shipbuilding in days of wooden sailing vessels; many historic landmarks: map M-82
 William L. Garrison at G-16
 New Caledonia (French Nouvelle Calédonie), French island 850 mi. e. of Queensland, Australia; 8548 sq. mi.; pop. 55,000; dependencies include Isle of Pines and Wallis and Loyalty isls.; nickel, chromium; livestock, copra, coffee: P-4, maps A-372a, P-10b
 French convicts F-188
 nickel N-143, picture N-142
 New Caledonia, fur-trading district in w. Canada belonging to Hudson's Bay Company in 19th century; mostly in British Columbia but extended s. of Canadian boundary.
 New Castle, the s. part of Castile, Spain, including the old Moorish kingdom of Toledo; chief cities are Madrid, Toledo, Ciudad Real; fertile river valleys, sterile elevated plateaus: map S-226
 New Castle, Del., city on Delaware River 5 mi. s. of Wilmington; harbor; pop. 4414; settled by Swedes 1640; landing place of William Penn 1682: D-40d, 42, map D-40, picture D-41
 New Castle, Ind., town on Blue River 45 mi. n.e. of Indianapolis; pop. 16,620; auto parts, kitchen cabinets; farm trade; roses; state village for epileptics 2 mi. n.
 New Castle, Pa., railroad center 42 mi. n.w. of Pittsburgh; pop. 47,638; on Shenango and Neshannock rivers; rich mining and farming region; iron, steel, and tin products, cement, pottery: map P-112
 Newcastle, city in New South Wales, Australia, 100 mi. n. of Sydney; pop. 105,000 with suburbs; great coaling port; ships wood, coal, mutton: map A-372a
 steel works A-374a, b
 Newcastle-under-Lyme, England, town 30 mi. s. of Manchester; pop. 20,000; famous potteries.
 Newcastle-upon-Tyne, great coal-shipping center of England, on Tyne River; pop. 285,000: N-81, maps E-279, E-270a
 Newchwang (nū'chwāng'), also Ying-kow, treaty port in s. Manchukuo at mouth of the Liao River; pop. 160,000: maps M-49a, J-186
 New College, Oxford O-260
 Newcomb, Simon (1835-1909), American astronomer, mathematician, and textbook writer, born Wallace, Nova Scotia; came to U.S. 1853; professor mathematics U.S. Navy after 1861; director of U.S. Nautical Almanac (1877-97); elected to Hall of Fame 1935.
 Newcomb College, at New Orleans, La.; founded 1886 by Mrs. Josephine Louise Newcomb as memorial to her daughter, Harriott Sophie Newcomb; for women; arts and sciences, art, music; affiliated with Tulane University.
 Newcome, Colonel, in Thackeray's 'The Newcomes' T-73
 Newcomen, Thomas (1663-1729), English mechanic; made first practical steam pumping engine: S-280, picture W-57
 New Connecticut, first name of Vermont V-288
 "New Dawn" rose, first patented plant P-245e

New Deal, legislative plan for economic recovery in U.S. R-146d-l, U-251. See also in Index Roosevelt, Franklin Delano
 agencies, table R-146g
 New Delhi (dē'lē), administrative capital of British India D-44, map A-332c
 New Echota, national memorial in Georgia N-22e
 Newell, Peter (1862-1924), American writer and illustrator of humorous books, especially for children; wrote 'Topsys and Turveys'; 'The Hole Book'; 'The Rocket Book'.
 New England, collective name for states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island, Outline U-199. See also names of states
 agriculture, colonial A-156-7, 167
 architecture, colonial A-168, picture A-270
 commerce: colonial A-158: trade with Far East A-333
 education, development E-175-6, 177, 178-9: historic colleges U-259
 fisheries A-158, F-79
 flags F-98, 99, color plate F-90
 floods F-106a, b
 history. See also in Index American Colonies; Colonial life in America
 Pilgrims settle P-261-3, A-151, M-91-4
 Indian affairs A-153
 New England Confederation A-156
 King Philip's War K-22-3
 American Revolution R-89
 War of 1812 W-10-11, J-209
 abolition movement G-17, W-96
 immigration in colonial period A-160
 literature A-176-9
 manufactures: colonial A-158; cotton leadership goes to South C-378; Industrial Revolution I-74h
 mountains N-85, U-183
 origin of name S-165
 Sabbath observance, colonial A-167, picture A-150
 slave trade P-357
 town government T-117, R-96
 water power U-186, W-49, pictograph W-50
 New England aster A-339
 New England candle pins, a bowling game B-207
 New England Confederation A-156
 John Winthrop leads W-119
 'New England Primer', famous school-book; written and printed by Benjamin Harris, Boston, about 1688; noted for alphabet rhymes, woodcuts, and child's prayer, 'Now I lay me down to sleep'.
 New England States, Outline U-199
 New Forest, wooded region in s.w. Hampshire, England, used as public pleasure ground
 William II (Rufus) killed in W-102
 Newfoundland (nū'fūnd-lānd), British crown colony; island in Gulf of St. Lawrence; 42,734 sq. mi.; pop. 290,000; cap. St. John's: N-82, map C-50c
 Cabot discovers C-9
 earthquake E-137
 fisheries N-82, F-79, H-200
 fogs F-132
 Labrador L-46
 seals S-68
 Newfoundland Banks, or Grand Bank, also Banks of Newfoundland, submarine plateau off coast of Newfoundland, fishing grounds N-82
 climate N-82: Gulf stream affects G-185
 Newfoundland dog D-81, 82, picture D-82
 New France, name for Canada under French rule A-145-6, Q-5. See also in Index Canadian history; French in America

Newgate, prison in London, built about 1200, several times remodeled, and demolished 1902; notorious for wretched moral and sanitary conditions due to crowding and mingling of prisoners.
 New Georgia Islands, group in Solomons halfway between Bougainville and Guadalcanal, map P-10b
 2d World War W-178y
 New Glasgow, Nova Scotia, coal and iron-mining town on East River 80 mi. n.e. of Halifax; pop. 8858; steel, lumber products, ships.
 New Gottenburg, first permanent settlement in Pennsylvania P-116
 New Granada, original Spanish name for Colombia C-306
 New Guinea, largest island of Malay Archipelago; 300,000 sq. mi.; pop. over 1,000,000: N-83-5, maps P-10b, E-142a
 birds of paradise, color plate P-64-5
 kangaroo K-1
 2d World War W-178y-z
 New Hampshire, New England state of U. S.; 9304 sq. mi.; pop. 491,524; capital Concord: N-85-8, maps N-86, U-188c
 bird, state B-122
 cities N-86-8, list N-85. See also in Index names of cities
 education N-88
 flag F-92, color plate F-87
 flower, state S-279
 forests, national and state, table F-250
 history N-88
 Massachusetts boundary dispute N-88
 Vermont boundary dispute V-287-8
 name, origin of, and nickname S-279
 natural features N-85-8
 products N-86-8, chart N-86, list N-85
 water power N-86
 New Hampshire, University of, at Durham, N. H.; state control; opened 1867 as New Hampshire College of Agriculture and Mechanic Arts; agriculture, engineering, liberal arts
 former "land grant" college E-182
 "New Hampshire Grants" V-287-8
 New Hanover. See in Index Lavongai
 New Harmony, Ind., town 22 mi. n.w. of Evansville on Wabash River; pop. 1390; settled 1815 by German Harmonists; property sold 1824 to Robert Owen for socialistic community: S-180, map I-46
 famous scientists at I-50
 New Haven, Conn., 2d city of state, seat of Yale University; pop. 160,605: N-88, map C-336
 early history C-340: fair F-4
 East Rock, picture C-338
 New England Confederation A-156
 telephone switchboard, picture T-37
 Yale University, picture C-340
 Newhaven, England, seaport on English Channel at mouth of Ouse River 50 mi. s. of London; terminus of channel steamer line to Dieppe, France.
 New Hebrides, group of islands e. of n. Australia, governed jointly by France and Great Britain; about 5700 sq. mi.; pop. 50,000; coffee, copra, cotton: maps A-372a, P-10b
 'New Héloïse, The', novel by Jean-Jacques Rousseau.
 New Holland, former name of Australia.
 New Iberia, La., city on Bayou Teche, 105 mi. w. of New Orleans; pop. 13,747; seat of Iberia Parish; center of agricultural region; settled by Spanish and French, some of the latter from Nova Scotia; cane sugar, salt, red pepper: map L-206

Key—cāpe, āt, fār, fāst, whōt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dq; cāre, bāt, rīde, fūll, bārn;

New Ireland, 2d largest island of Bismarck Archipelago; mandate of Australia; 3340 sq. mi.; pop. 45,000; formerly New Mecklenburg; mountainous and volcanic; coconut plantations: N-85, map P-10b

New Jersey, a cent. Atlantic state of U.S.; 7836 sq. mi.; pop. 4,160,165; cap. Trenton: N-89-93, maps N-90, U-188c

agriculture N-89, 92
antiquities, Stone Age A-148
bird, state, table B-122
cities N-90-1, list N-89. *See also in Index* names of cities
dunes S-21

education N-80, 92: Trenton T-138
flag F-92, color plate F-87
flower, state, table S-279
forests, state, table F-250
government N-93: "big business" T-146

history N-92-3: American Revolution R-90; Wilson's administration W-106

manufactures N-90: glass, colonial days A-174; Jersey City J-210; Newark N-80; Paterson P-88; buttons B-287; Trenton T-138
minerals N-91-2: glass sand G-106; greensand M-184

name, origin of, and nickname S-279
national historical park, Morristown N-22b

products, chart N-90, list N-89

New Jersey Plan, for U. S. Constitution U-207, 208, N-92-3

New Jersey tea, or redroot, a genus of shrubs (*Ceanothus*) of the buckthorn family having showy clusters of small white, blue, or pink flowers followed by black berries; leaves were used as tea during American Revolution; has dark red root.

New Jerusalem Church. *See in Index* Swedenborg

New Kensington, Pa., industrial borough 15 mi. n.e. of Pittsburgh on Allegheny River; pop. 24,055; large aluminum, steel and iron, and plate glass manufactures.

New Lanark, village in Scotland, 25 mi. s.e. of Glasgow
Robert Owen S-180

Newlands, Francis Griffith (1848-1917), American legislator and lawyer, born Natchez, Miss.; served as congressman five consecutive terms and as senator from Nevada three terms; author Newlands Act (1913) for mediation in railroad wage disputes.

Newlands Reclamation Project N-76

New London, Conn., port and summer resort on Thames River 40 mi. e. of New Haven; pop. 30,456; printing presses, silk and rayon goods; Connecticut College for Women, founded 1646; U. S. Coast Guard Academy; burned by British under Benedict Arnold 1781; Harvard-Yale crew races each June: map C-336

New Madrid, Mo., city in s.e. on Mississippi River 50 mi. s. of Cairo, Ill.; pop. 2450; agricultural and lumber interests; important Confederate post 1861-62: maps M-208, C-253

earthquake (1811-12) E-136, M-209
Newman, John Henry, Cardinal (1801-90), English churchman N-94
Newmarket, England, town 14 mi. n.e. of Cambridge; pop. 10,000; famous for horse races.

New Mecklenburg. *See in Index* New Ireland

New Mexico, state of s.w. U. S.; 121,666 sq. mi.; pop. 531,818; cap. Santa Fe: N-94-9, maps N-97, U-188b
antiquities A-148

bird, state, table B-122
cities N-98-9, list N-94. *See also in Index* names of cities

cliff dwellings C-269-70
climate N-96-7
education N-98-9

flag F-92, color plate F-87
flower, state, table S-279
forests, national and state, table F-250

fossils H-341
history N-98, 99

acquired in Mexican War M-132
American immigration S-224
missions S-222, picture S-222

Pike's visit F-14
Santa Fe Trail F-16

Indians I-55, N-99, picture N-95;
cliff dwellers C-269-70; corn dance, picture F-11; Pueblo P-365; raids I-68

irrigation N-97-8, R-109
minerals N-98: potash deposits P-324

name, origin of and meaning, and nickname S-279

national parks and monuments N-99, N-20, 21, 22, 22a, c: Carlsbad Caverns C-117, N-20-1, pictures N-18, N-97

natural features N-94-6
plant and animal life N-96
population increase, map U-198a

products N-97-8, chart N-97, list N-94: live stock N-97
timber N-98

'New Mexico', United States battleship, picture N-54

New Mexico, Museum of, at Santa Fe, N. M., table M-392

New Mexico, University of, at Albuquerque, N. M.; established 1889, opened 1892; colleges of arts and sciences, education, engineering, and graduate school.

New Mexico College of Agriculture and Mechanic Arts, at State College, near Las Cruces, N. M.; state control; founded 1889; agriculture; home economics; general science; civil, chemical, electrical, irrigation, and mechanical engineering; business administration; liberal arts; music.

New moon M-250

New Netherland, Dutch colony in America, later New York N-121, A-155-6
education E-176

New Orleans (*ô'r'lê-ânz*), La., port on Mississippi River, 107 mi. above its mouth; pop. 494,537: N-100-3, maps L-206, U-188c
commerce N-100-1, M-206, N-103
education N-103

flood control N-101, 100, 103
French quarter N-102

harbor N-100, H-215, picture N-100
history N-103, L-208: battle in War of 1812 W-10, J-178; river traffic M-206; capture by Farragut during Civil War F-13, P-305

Huey P. Long Bridge N-100, picture B-240a

manufactures N-101

Mardi Gras N-102, picture L-207

New Orleans, battle of W-10
Chalmette Historical Park N-21

New Philadelphia, Ohio, manufacturing city with coal-mining and clay-working interests on Tuscarawas River and Ohio Canal about 70 mi. s. of Cleveland; pop. 12,328; stamping and metal products plants.

New physics, term applied to such developments in physical theory as the supposed electronic structure of matter, the quantum theory of energy, and relativity of time and space P-189, 194-6

atom structure A-360-2
quantum theory R-16, S-244

relativity E-211-13

New Plymouth, New Zealand, seaport and railroad terminus on w. coast of North Island; pop. 17,000; flour mills, leather manufactures; trade in dairy products: maps A-372a, P-10b

New Pomerania. *See in Index* New Britain

Newport, Christopher (1565?-1617), English sea captain, in command of ship which brought Capt. John Smith to America; made several later voyages to Virginia
manufactures glass A-173

Newport, England, port in s.w. on Usk River 4 mi. from Bristol Channel; pop. 96,000; coal, iron, cattle trade; iron products: map E-270a

Newport, Isle of Wight, England, capital and chief market town of island; at head of estuary of Medina River; pop. 11,000; timber, malt, wheat, flour.

Newport, Ky., residential city on Ohio and Licking rivers, opposite Cincinnati, Ohio; pop. 30,631; sheet iron, tile, glass, concrete blocks; Fort Thomas, U. S. military post, 2 mi. south: map K-11

Newport, R. I., fashionable resort on s.w. coast of island of Rhode Island; pop. 30,532; beautiful estates; much historic interest; U. S. Naval College and torpedo station; founded in 1639: R-98, map R-97, picture R-98

first gas street lighting G-22
in 1857, picture U-243

Newport News, Va., seaport and shipbuilding center on James River at head of Hampton Roads; pop. 37,067. Settled in 1621 by Irish colonists, but development did not begin until completion of railway from Richmond to mouth of James River in 1882 when town was plotted. Four years later a great shipyard (now the Newport News Shipbuilding and Dry Dock Co.) was begun and prosperity followed. Incorporated as city 1896; Fort Eustis, artillery training camp, near by: N-149, map V-306

New Providence Island, chief island of the Bahamas; 58 sq. mi.; pop. 20,000; contains only good natural harbor of the group, and Nassau, the capital; settled by English 1629: map U-188c

New River, headstream of Kanawha; rises in Blue Ridge Mts. of North Carolina, flows across w. corner of Virginia and joins Gauley River in Fayette County, W. Va.

New Rochelle, N. Y., residential suburb and summer resort on Long Island Sound, n. of New York City; pop. 58,408; settled 1688 by Huguenots from La Rochelle, France: map N-114

New Rochelle, College of, at New Rochelle, N.Y.; Roman Catholic institution for women, founded 1904; arts and sciences.

New Salem, Ill., home of Abraham Lincoln; pop. 257: L-140, 142, I-13

New Salem State Park, Illinois I-13, L-139

Newsboys Foundation, Harry E. Burroughs, Boston, Mass.; established 1928 by Harry E. Burroughs to raise cultural level of newsboy.

New Siberian Islands, in Arctic Ocean n. of Siberia; largest Kotelnoi (116 mi. by 100 mi.); uninhabited except for hunters: maps A-277, A-332b

"New skin," collodion C-302
News magazines M-25

New South Shoal lightship, picture L-134

New South Wales, Australia, state in

s.e.; 309,432 sq. mi.; pop. 2,600,000; cap. Sydney: N-103, *map* A-372a
 founded A-373
 minerals A-374b
 steel industry A-374a, b
 New Spain, name of American Southwest during Spanish rule S-221-4
 Newspapers N-104-9
 advertising A-23-4, N-107: censorship A-24a, N-107; display type L-153, *pictures* A-24, 24a; history A-25; income from N-107, A-24b; space and rate policy A-24a, 24b
 American colonies A-166-7
 censorship. *See in Index* Freedom of the press
 circulation N-107: audit for advertising A-24b
 comic strips and cartoons N-108
 cooperative news bureaus N-109
 engraving processes E-296-8
 freedom of the press. *See in Index* Freedom of the press
 historical development N-106-7: De-foe's *Review* D-38; *Tatler* and *Spectator* E-285
 journalism as career N-108
 library, or "morgue" N-109
 linotype L-149-53
 magazines, how different M-25
 micro-filming N-109
 news gathering and editing N-104, 106, 108-9; pneumatic tube transmission P-264-5
 paper P-56-61
 pictures in N-108, 109: telephotography T-41-2
 printing P-348, *picture* P-347
 publicity material A-24b, N-109
 radio service to readers M-62
 reading N-108, R-58
 reporters and foreign correspondents N-109
 social service, in Buenos Aires B-260
 sources of news material N-109
 stereotyping S-287
 syndicated features N-108, 109
 tabloids N-107
 telephotography T-41-2, N-109
 town crier forerunner, *picture* C-324a
 Newsprint, trade name for the kind of paper on which newspapers are usually printed; made from wood pulp: P-61, P-220
 News service
 motion picture M-273-4
 radio R-28-9, *picture* R-31b: for ships M-62
 New stars, or novae S-275
 New Stone Age, or Neolithic Age M-46, 47, 48, S-293, *pictures* C-119, M-47, *color plate* M-48c-d
 New Sweden, Swedish colony in U. S. on Delaware River 15 mi. s.w. of Philadelphia; founded 1638: D-41-2
 Newt, a long-tailed aquatic of the salamander family S-12
 foot, *picture* F-147
 New Testament B-102, 104
 Codex Sinaiticus B-104, *picture* B-102
 Epistles of Paul P-90
 Epistles of Peter P-141
 Gospels J-213, A-229-30
 New Thought, a system of idealistic philosophy; in America developed around writings of Ralph Waldo Emerson; affirms control of material conditions and circumstances by mental power but does not deny existence of matter.
 Newton, Sir Isaac (1642-1727), English physicist and mathematician N-110-12, *picture* G-141
 astronomical contributions A-342, G-140
 color studied and explained S-241
 corpuscular theory of light revived R-16
 gravitation, law of G-140-2
 Kepler's work completed by K-15

light, theory of L-128, R-16
 motion, laws of M-106: Einstein theory of relativity modifies E-212-13
 "Newton's Rings," *diagram* L-128
 precession of equinoxes explained E-134
 reflecting telescope invented by T-38, *picture* T-40
 sound, fundamentals studied S-198, E-144
 Voltaire spreads philosophy V-335
 Newton, John (1725-1807), English clergyman and poet
 collaborates with Cowper C-387
 Newton, Iowa, city 30 mi. n.e. of Des Moines in rich agricultural section; pop. 10,462; washing machines, steel, iron, and aluminum castings, excavating machinery.
 Newton, Kan., city 25 mi. n. of Wichita; pop. 11,048; farming and stock raising; flour mills, railroad repair shops, creamery; Bethel College (Mennonite): *map* K-4
 Newton, Mass., suburb of Boston, on Charles River pop. 69,873; Boston College and Andover Newton Theological School.
 Newton's Laws of Motion M-106
 second law applied P-191
 New Towne, original name of Cambridge, Mass. C-36
 New Ulm, Minn., town on Minnesota River, 75 mi. s. w. of Minneapolis; pop. 8743; settled by Germans; attacked in Sioux uprising of 1862; flour and cereal mills: *map* M-192
 New Westminster, British Columbia, port on Fraser River 12 mi. s.e. of Vancouver; founded 1859; cap. of province until 1868; pop. 17,524; lumbering, fishing, fruit- and vegetable-canning, shipbuilding; exports lumber and lumber products, copper, lead, and zinc: *map* C-50b
 "New World Symphony", musical composition by Dvorák M-315
 New Year's Day N-112-13
 China N-112, H-322, *picture* H-322
 Japan J-193-4
 president's reception W-88
 New Year's Day, Jewish (Rosh Hashanah), festival celebrated on the first or first and second days of Tishri (corresponding to September or sometimes October)
 ram's horn blown, *picture* J-216
 New York, a middle Atlantic state of U. S.; 49,576 sq. mi.; pop. 13,479,142; cap. Albany: N-113-22, *maps* N-114, U-188c
 agriculture N-119-20: apples A-231; colonial conditions A-157, 167; dairying N-119, C-164; grapes G-136; honey B-76
 bird, state B-122
 cities N-119-20: list N-113. *See also in Index* names of cities
 commerce N-118-19: Buffalo B-261; canal era C-68-9; New York City N-133, 134
 education N-122, *pictures* N-132, N-119: Buffalo B-262; early schools E-176; New York City N-131; Rochester R-121; Syracuse S-361; Troy T-145; West Point Military Academy M-170-2
 fisheries L-195
 flags F-92, *color plate* F-87: historic F-99, *color plate* F-90
 flower, state S-279
 forests, state, *table* F-250
 government N-122
 history N-120-2, N-133-4
 Hudson's voyage H-348
 Long Island explored and settled L-195
 Albany settled A-108
 Stuyvesant governor S-310-11
 English acquire N-121
 Albany Congress A-108

Pennsylvania land claim P-117
 Vermont dispute V-287-8, N-88
 Revolutionary War R-89-90: battle of Long Island L-195; battle of Saratoga S-28; West Point M-172
 ratification of Constitution U-209
 Erie Canal opened (1825) C-69
 Mormonism founded M-258
 Tammany influence T-7
 Cleveland, governor C-266
 T. Roosevelt, governor R-148
 Hughes, governor H-351
 F. D. Roosevelt, governor, R-146d
 Long Island L-195
 manufactures N-119, N-133, R-121, list N-113: buttons B-287; collars T-145; electrical machinery S-38; gloves G-107
 minerals, list N-113: salt S-361
 name, origin and meaning of, and nickname S-279
 natural features N-114-18: Adirondack Mts. A-21; Hudson River H-350; Niagara Falls N-137-40
 parks and memorials N-18, 22, 22d, / products, *chart* N-114, list N-113
 transportation N-118-19, B-261, N-131, 133: canals C-68-9, N-118-19
 New York, College of the City of. *See in Index* City of New York, College of the
 New York, University of the State of, actually the department of education of New York state; headquarters at Albany; supervises public schools and licenses members of professions for practice in the state; governed by board of regents, which appoints the commissioner of education.
 New York asters A-339
 New York City, N. Y., 2d largest city of world; pop. 7,454,995: N-123-34, *maps* N-114, N-130
 advantages of location N-114, N-133
 airports N-133
 art galleries. *See in Index* Museums, *table*
 bridges N-133, B-240, 240b, *pictures* N-127, 129, B-240b
 Brooklyn B-249
 Cleopatra's Needle A-116, *picture* N-126
 Coney Island C-329
 educational institutions N-131, *pictures* N-132
 Ellis Island I-24, *map* N-130, *pictures* N-124, I-22
 Federal Reserve Bank (2d) and district, *map* F-22
 financial supremacy N-133, 134
 fur market F-228
 government N-134, M-302
 Greater New York, boroughs N-134
 "Great White Way," or Broadway E-238, N-126-7, *picture* N-128
 Hall of Fame, New York University H-201-2, *picture* N-132
 harbor and islands N-123-4, N-133, N-114, *pictures* N-129: Ambrose Channel H-217; Brooklyn, *picture* H-216; spring tide T-91
 history N-133-4
 Dutch bargain for Manhattan I-53, *picture* A-153
 New Amsterdam, *picture* A-155
 under Dutch rule S-310-11, A-155-6
 colonial trading center A-165
 Federal Hall (1790), *picture* U-236
 early 19th century U-241, *pictures* U-240
 fire of 1835 N-134
 draft riots, Civil War N-134
 Fifth Avenue in the 1880's, *picture* A-314
 Roosevelt as police commissioner R-148
 libraries L-106b, f, h, N-127, *pictures* L-106c
 manufactures N-133
 memorials and monuments N-124, 126-30: "Cleopatra's Needle"

A-116, picture N-126; Grant's tomb G-133, picture N-126; Lafayette B-52; Liberty, statue of L-101, N-123, pictures L-101, N-124; Nathan Hale, picture H-199 museums. See in Index Museums, table
parks N-131
population: density N-125; foreign peoples N-131
railroad stations R-40, 44, N-127, picture N-133
rivers N-123-4, H-350
Rockefeller Center, picture A-272a
skyscrapers N-125, pictures N-123, 125, 128, 129, 132, A-272, 272a
smoke detecting machine, pictures A-385
Stock Exchange and "curb" S-292
streets and buildings N-125-30
subways and tunnels T-152, 154, N-131, 133, pictures N-131, 134, C-241, T-152-3
Tammany Hall T-7
transportation C-241, N-131-3: elevated railway (1890), picture H-229
water supply W-53, 54, 55, D-6b, pictures W-53, N-120: aqueduct, pictures A-236, W-54
wild animal trade Z-220
World's Fair F-5, pictures F-4b
zoological garden Z-224
New York clearing house B-42
New York Museum of Modern Art, in New York City, table M-392
New York Philharmonic Orchestra M-316
New York Public Library L-106b, f, N-127, picture L-106c
begun by Tilden bequest N-122
New York regiment
Revolutionary flag F-99, color plate F-90
New York State Barge Canal N-118-19, map G-146a, pictures H-216
Erie Canal link N-118-19, C-69, T-125, picture C-67
New York State College for Teachers, at Albany, N. Y.; founded 1844; arts and science.
'New York Tribune', started by Greeley G-174
New York University, at New York, N. Y.; established 1831; arts and sciences, commerce, education, engineering, fine arts, law, retailing, medicine, dentistry
Hall of Fame H-201-2, picture N-132
New York World's Fair (1939 and 1940) F-5, pictures F-4b
New Zealand, Dominion of, British dominion comprising a group of islands in South Pacific Ocean; 103,415 sq. mi.; pop. 1,575,000; cap. Wellington: N-135-6, maps P-10b-c, A-372a, b, A-214
animals: kea P-82; tuatara L-172
Antarctic dependency A-217
cities N-135
climate N-135-6
commerce N-136, table C-480
Cook's explorations C-347d
dependencies N-136, P-8, map P-10b-c: Samoa S-20
earthquake E-137
flag F-96, color plate F-89
Franz Josef Glacier, picture G-95
government N-136: cabinet C-3
kauri gum G-188
labor legislation L-44d
Maori natives N-136, picture N-135
national parks N-23
natural features N-135
products N-136
whaling, picture W-80
Nexö (nēks-ä'), Martin Andersen (born 1869), Danish novelist S-36
Ney (nä), Elly (born 1882), German pianist; taught at Cologne Conservatory; through tours in Europe and U. S. became known as one of

the greatest pianists of the day; married Willem Van Hoogstraten, conductor.
Ney (nä), Michel (1769-1815), French marshal N-136-7
at Quatre Bras W-48
Nez Percé (nä pēr-sä') (French for "pierced nose"), tribe of Shahap-tian Indians, who formerly roamed from e. Oregon and Washington to Bitter Root Mts. and s. to Snake River.
Ngami (ngü'mē), lake in Rhodesia, Africa; remnant of former great inland sea, now marshland.
Nghanwei (n'gân'huä'), or Anhwei, inland province of China in e.; 51,902 sq. mi.; pop. 23,265,000; cap. Anking: map C-212
Ngawun, Burma. See Bassein
Niacin, a vitamin V-311a
'Niagara', American warship in battle of Lake Erie P-126
Niagara Falls, N. Y., resort and industrial city on Niagara River, 20 mi. n.w. of Buffalo; pop. 78,029; Niagara University: N-140, map N-114
calcium carbide manufactured A-7
graphite made artificially G-136
power station, picture N-116
Niagara Falls, Ontario, Canada, city opposite Niagara Falls, N. Y., in agricultural and fruit growing region; pop. 19,046; enormous hydroelectric plants; cereals, batteries, carborundum, hats, silverware; railway center: map C-50c
Niagara Falls, one of greatest falls in world N-137-40
Horseshoe Falls N-138
hydroelectric power N-138, N-119, pictures W-52, N-116, N-139: Buffalo B-261; London, Ont. L-191
name, meaning N-138
Welland Ship Canal W-70
Whirlpool N-138, W-85
Niagara Gorge N-138
Niagara River, outlet of Lake Erie flowing n. to Lake Ontario, 33 mi.: N-137-40, map N-114
Niagara University, at Niagara Falls, N. Y.; for men; Catholic; founded 1856; arts, sciences, philosophy, and business administration.
Niagara Whirlpool W-85, N-138
Niam-Niam (nyäm-nyäm'), Azandeh, or Zandeh, an important group of tribes of mixed negroid descent in n.e. Belgian Congo and s.w. Sudan; expert agriculturists; formerly a warlike people, skilled in the use of the throwing knife; Niam-Niam means "eaters," and they were so called because many were addicted to cannibalism.
Niantic, or Nehantic, the name of two distinct Algonquian tribes, one formerly occupying the coast of Rhode Island from Narragansett Bay to about the Connecticut state line, the other the Connecticut coast from Niantic Bay to Connecticut River. The former became a part of the Narragansett and the latter were absorbed by the Mohegan after the Pequot War. of 1637.
Nias (nē-äs'), island in Netherlands Indies, v. of Sumatra; 1842 sq. mi.; pop. about 160,000: pictures E-141, 142c
'Nibelungs' (nē'bē-lungs), Song of the, or 'Nibelungenlied', German epic of 13th century: N-140, G-62
Siegfried legend S-140-1, S-303c
Wagner's operas W-1: stories of operas O-232-3; musical themes M-314
Niblick, an iron golf club, picture G-118

Nicaea (nī-sē'ä), or Nice (modern Isnik, Turkey), important ancient city of Bithynia, Asia Minor, on Lake Ascania 60 mi. s.e. of Constantinople; declined under Turkish rule (14th century)
council of (325 A.D.) C-232, C-346, E-140
Nieandra (nī-kän'drā), an annual plant (*N. physalodes*) of the nightshade family, native to Peru; grows to 4 ft.; leaves oval, toothed; flowers blue, 1 in. across, wheel-shaped, solitary; escaped from cultivation in U.S.; also called apple-of-Peru.
Nicaragua (nik-ä-rü'gwä), largest of Central American republics; 49,200 sq. mi.; pop. 850,000; cap. Managua: N-140-1, C-131-4, maps C-132, N-150c
flag F-96, color plate F-89
history C-133d
literature L-67w, s
Mount Cosequina, picture C-133
products N-141
United States intervention: Coolidge sends marines N-141
Walker's filibustering expedition P-214
Nicaragua, Lake, largest lake in Central America, in s.w. Nicaragua; drained by San Juan River: N-141, map C-132
Nicaragua Canal, project N-141, A-314
Nicaia (nē-kä-rē'ä), ancient Icaria, Greek island in Aegean Sea 130 mi. s.e. of Athens; taken from Turkey after Balkan Wars 1912-13; 83 sq. mi.; produces charcoal, sponges.
Niccoli (nēk-kō'lē), Niccolò de' (1363-1437), Italian humanist R-74
Niccolo Pisano. See in Index Pisano, Niccolo
Nice, or Nicaea, Bithynia, ancient city in Asia Minor. See in Index Nicaea
Nice (nēs), France, resort on Riviera; pop. 245,000: N-141, maps E-326d, F-179, picture F-177
ceded to France V-294
perfume industry P-124
N'cene Creed C-232, C-346
Nicholas (nik'ō-läs), Saint (4th century), bishop of Myra, Asia Minor; in many legends, bountiful patron of children; his feast day (December 6) is near Christmas; hence he comes to be the Christmas gift-bringer, "St. Nick" or "Santa Claus": C-228, 229a-b
Nicholas I, pope 858-867; sometimes called "the Great," one of the most vigorous of the early popes, uncompromising in upholding his claims to universal jurisdiction.
Nicholas II, pope 1059-61; restricted election of popes to College of Cardinals; greatly influenced by Hildebrand (later Gregory VII).
Nicholas III (1216?-80), pope 1277-80; materially strengthened temporal power of the church; man of strict morals and considerable learning. He belonged to the house of Orsini.
Nicholas IV, pope 1288-92, first Franciscan monk to become pope; encouraged Crusades and sent missionaries to the East.
Nicholas V (1397-1455), pope 1447-55; founded valuable library and manuscript collection; extended wide patronage to classical scholars of Renaissance.
Nicholas I (1796-1855), czar of Russia N-141-2, R-184
Nicholas II (1868-1918), czar of Russia N-142, R-186-9

- Edward VII, relations with E-190
limitation of armaments P-92
William II, correspondence with W-100
- Nicholas, or Nikita (1841-1921), hereditary prince of Montenegro; succeeded 1860; assumed title of king 1910; driven into exile by Germans during 1st World War; deposed 1918 when Montenegro became merged into Yugoslavia; resisted this deposition until his death.
- Nicholas, Grand Duke (1856-1929), grandson of Czar Nicholas I; appointed commander in chief of Russian army 1914; took field in person in vain attempt to check Austro-German offensive of 1915; later commander in chief in Caucasus where he carried out successful offensive; removed from command after Czar's abdication; died in Paris.
- Nicholas II Land, Russia. *See in Index* Severnaya Zemlya.
- 'Nicholas Nickleby', novel by Charles Dickens in which the evils of cheap schools are disclosed; the hero began his career at Squeers' school, Dotheboys Hall, Yorkshire.
- Nicholas of Pisa. *See in Index* Pisano, Niccolo.
- Nichols, Robert Malise Bowyer (born 1893), English poet; wounded in 1st World War; poetry: 'Under the Yew'; drama: 'Wings over Europe', with Maurice Browne).
- Nichols Field, U. S. Army air field on Luzon Island, P. I., 6 mi. from Manila; attacked by Japanese December 1941.
- Nicholson, Francis (1655-1728), English colonial official, born near Richmond, England; between 1688 and 1725 was lieutenant governor or governor of Virginia, Maryland, Nova Scotia, South Carolina; noted for encouragement of education.
- Nicholson, Meredith (born 1866), American novelist and essayist, born Crawfordsville, Ind.; U. S. minister to Paraguay 1933-34, to Venezuela 1935-38, to Nicaragua after 1938 ('The House of a Thousand Candles'; 'The Port of Missing Men'; 'A Hoosier Chronicle').
- Nicholson, William (1753-1815), English writer and lecturer; edited *Journal of Natural Philosophy, Chemistry, and the Arts*, earliest work of the kind in England; wrote 'An Introduction to Natural Philosophy'; invented an aerometer and discovered a way of decomposing water by voltaic current.
- Nichrome, an alloy A-132.
- Nicias (*nish'i-as*) (died 414 B.C.), Athenian statesman and general in Peloponnesian War; became leader of aristocrats on death of Pericles; arranged Peace of Nicias (421 B.C.) between Athens and Sparta, which terminated first decade of Peloponnesian War.
- "Nickel," a five-cent piece A-132.
- Nickel, a metal N-142-3, C-175, 168 alloys A-130, 132; alnico, *picture* A-133; electric lamp N-143, E-234; German silver C-361, N-143; monel metal C-361, N-143 coin, composition N-142 electrochemical activity E-239 electroplating E-243 electrotyping E-243 glass colored by G-102 magnetic nature explained E-228 meteorites contain M-126, 128 name, origin C-290 plating N-142: replaced by chromium C-230 production of world, *pictograph* M-189
- silver N-142-3 sources N-143, *pictures* N-142, O-227 steel N-143, A-130 weight I-134
- Nickelo'deon, in history of motion pictures, the place where "nickel shows" were given; now sometimes applied to automatic pianos and phonographs in public places.
- Nicknames N-143 origin of "Yankee" Y-204 states of U. S. S-279
- Nicobar (*nik'o-bar*) Islands, group of islands in Bay of Bengal n.w. of Sumatra; 635 sq. mi.; pop. 10,000; chief product coconuts: I-43, *map* I-30
- Nicodemus, in New Testament, a prominent Pharisee, who visited Jesus by night as an inquirer (John iii); helped to bury Jesus.
- Nicolai (*ne'ko-li*), Elias (died after 1660), German sculptor S-59
- Nicolay (*nik'o-la*), Helen (born 1866), American author, daughter of J. G. Nicolay, born Paris, France ('The Boy's Life of Ulysses S. Grant'; 'The Book of American Wars'; 'The Boy's Life of Lincoln').
- Nicolay, John George (1832-1901), American author, secretary to Lincoln; born Bavaria; joint author with John Hay of 'Abraham Lincoln: A History'.
- Nicolet (*ne'ko-le'*), Jean, early French explorer in America (1634-35) W-122, 126 upper peninsula, Mich. M-154
- Nicoll, Sir William Robertson (1851-1923), English man of letters, known as authority on the Brontë family ('Literary Anecdotes of the Nineteenth Century'; 'Life of Ian Maclaren'; 'Life of the Brontës').
- Nicollet, Joseph Nicholas (1786-1843), French explorer and mathematician; came to U. S. 1832; official surveyor of upper Mississippi and Missouri rivers (1836-39); made valuable maps and reports.
- Nicolls, Sir Richard (1624-72), first English colonial governor of N.Y.; sent to America to organize attack on New Netherland; firm conciliatory executive; won respect both of Dutch and English.
- Nicomedia (*nik'o-me'di-a*), ancient city of great splendor on e. arm of Sea of Marmara; capital of Bithynia; Hannibal committed suicide near by (183 B.C.); Constantine the Great died here (337 A.D.); modern Izmit (also Ismid or Kocaeli) in Turkey; busy seaport: pop. 19,000.
- Nicopolis, Bulgaria, also Nikopol, town in n. on Danube River at junction with Osem; pop. 5000; military post battle of (1396) T-162
- Nicopolis, or Actia Nicopolis, ancient city of Epirus, in Greece near n.w. coast; now in ruins; founded 31 B.C. by Augustus to commemorate victory over Antony at Actium.
- Nicosia (*ni'ko-se'a*), cap. of island of Cyprus; pop. 23,700; silk, leather, woolen products: *map* E-326e
- Nicot (*ne'ko'*), Jean (1530-1600), French diplomat, brought tobacco to France; scientific name of tobacco given in his honor: T-104
- Nicotia'na, tobacco plant genus T-104
- Nicotine, poisonous alkaloid in tobacco T-104 chemical properties A-10 sulphate, as spray S-263
- Nicotinic acid, a vitamin V-311a, 312 cooking, effect of V-311a in bread B-232
- Nietheroy, Brazil. *See in Index* Niteroi
- Nidaros (*ne'du-rös'*), Norway. *See in Index* Trondheim
- Niebuhr (*ne'bu'*), Barthold Georg (1776-1831), German historian and classical scholar, pioneer in modern historical methods; his 'Roman History' regarded as epoch-making.
- Niehaus (*ne'hous*), Charles Henry (1855-1935), American sculptor, born Cincinnati, Ohio; work outstanding for simplicity, excellent composition and classical line; did many public memorials (statues of Garfield, McKinley, Dr. Hahnemann, John Paul Jones, Lincoln).
- Niello (*ne-el'lo*), or black work, in decorating metals E-294
- Niel'sen, Alice (1876-1943), American dramatic soprano; born Nashville, Tenn.; won first success in comic opera; famous for Mozart rôles.
- Nielsen, Kay (born 1886), artist and illustrator of children's books; born Copenhagen, Denmark; moved to America; work reveals rare imagination; illustrated 'Fairy Tales', by Hans Christian Andersen and 'East of the Sun and West of the Moon', by Edgar Parin d'Aulaire.
- Niemen (*nyä'mén*) River, also Nemunas and Memel, rises in Russia, s. of Minsk, and flows 500 mi. across northern Poland, southern Lithuania, and between East Prussia and Lithuania, to the Baltic Sea, near Memel; internationalized by Treaty of Versailles scene of Peace of Tilsit N-10
- Niepee (*ne-éps'*), Joseph Nicéphore (1765-1833), French physicist, one of inventors of photography.
- Nierembergia (*ne-rém-bér'gi-a*), or cup-flower, a genus of dainty perennial plants with many bell-shaped flowers, violet or white. Native to tropical America; sometimes called blue-cup and white-cup.
- Nietzsche (*ne'chü*), Friedrich Wilhelm (1844-1900), German philosopher; exalted self-assertion, the "will to power," as the final self-justifying good in life; denounced Christian virtues of pity and humility as "slave morality"; died insane ('Beyond Good and Evil'; 'The Will to Power'; 'Thus Spake Zarathustra'); G-63, *picture* G-62
- Nieuwland (*nü'länd*), Julius A. (1878-1936), American chemist, Catholic priest, and educator, born Belgium; professor at Univ. of Notre Dame discoveries in chemistry of rubber R-169a
- Nieuwveld (*nyu'velt*) Mountains, division of main range in province of Cape of Good Hope A-38
- Nifheim (*nif'l-him*), in Norse myth, land of eternal cold and night.
- Nigella (*ni-jél'a*), or fennel-flower, a genus of annual plants of the buttercup family, native to Mediterranean and Turkestan. Grows 1 to 2 ft.; leaves thread-like; flowers with 5 petals, white, blue, or yellow surrounded by collar of leaves; seed-capsule a balloon enclosed in net of fine leaves; one species, love-in-a-mist (*N. damascena*), also called devil-in-a-bush.
- Niger (*ne-zhér*), French colony in French West Africa, n. of Nigeria; includes part of Sahara desert; acquired by France 1912, made a colony 1922; area about 500,000 sq. mi.; pop. about 1,745,000; cap. Niamey: *map* A-42a
- Nigeria (*nü-jé'ri-a*), British colony and protectorate in lower basin of Niger River in West Africa; 338,-

- 600 sq. mi.; pop. about 19,150,000; including Cameroons under British mandate, Nigeria has an area of 372,674 sq. mi. (pop. about 20,000,000); chief port and cap. Lagos; exports palm products, cocoa, hides; tin mines: *map* A-42a
- Niger** (*nī'gēr*) River, 3d largest river of Africa (2600 mi.) N-143-4, *maps* A-42a, b
jungles A-36
- "Nigger-toe," or Brazil nut N-187
- Night blindness E-350, V-310
- Night-blooming cereus, a cactus C-11
- "Night eye" E-350
- Nighthawk, a bird of the goatsucker family N-144, *pictures* N-144, *color plate* B-136
food habits B-122, N-144
- Nightingale, Florence (1820-1910), English war nurse N-145, H-345
- Nightingale, a song-bird N-144-5
migrating instinct A-202
- Nightjar, various large-mouthed insect-eating birds, including night-hawks N-144
foot, *picture* B-129
- Night-phlox. *See in Index* Zaluzian-skya
- Night schools, for adults E-187
- Nightshade, a plant of the genus *Solanum*; usually one with poisonous properties: N-145
- Nightshade, deadly, or belladonna N-145, P-275, *picture* P-273
- Nightshade family, or Solanaceae, a large group of herbs, rarely shrubs, with small flowers, and alternate leaves; fruit, a capsule or berry; includes potato, tomato, tobacco, egg-plant, petunia, as well as many poisonous species: N-145, P-325
- "Night Watch," by Rembrandt R-73
- Nihilists (*nī'hil-ists*), Russian revolutionists T-157
Alexander II assassinated by A-113
literary influence R-197
- Nihoa (*nī-ē-hā'g*), an island of the Hawaiian group; 73 sq. mi.; pop. 182; sheep: *maps* H-242, 243
- Niitaka-yama, Formosa (12,959 ft.), highest peak in Japanese Empire; also called Mount Morrison.
- Nijnska, Brontislava, ballet dancer and choreographer, sister of Vaslav Nijinsky; dancer with Imperial Russian Ballet and Diaghileff's ballet; composed over 200 ballets ('Gypsy Dances'; 'Hundred Kisses'); came to U. S. 1940.
- Nijnsky (*nī-jīn'ski*), Vaslav (born 1890), brilliant Russian ballet dancer, born Kiev; trained in Russian Imperial Ballet School; made debut 1907; with Diaghileff's Russian Ballet 1911-13; American debut 1916; mental breakdown ended career; most famous creations 'Spectre of the Rose'; 'Les Sylphides'; 'Afternoon of a Faun'.
- Nijmegen (*nī-mā-jēn*), Netherlands, also Nimwegen, manufacturing and trading center on Waal River; pop. 82,000; ancient Roman camp.
- Nijni Novgorod. *See in Index* Gorky
- Nike (*nī'kē*), in Greek mythology, goddess of victory.
- Nike Ap'teros. *See in Index* Wingless Victory, Temple of
- Nike of Samothrace. *See in Index* Winged Victory
- Nikisch (*nē'kēsh*), Arthur (1855-1922), Hungarian orchestral conductor, especially noted for interpretations of Wagner; conductor of Boston Symphony Orchestra 1889-93; conductor of famous Leipzig Gewandhaus concerts from 1895 to his death.
- Nikita, king of Montenegro. *See in Index* Nicholas
- Nikko (*nēk'ō*), name of mountainous region about 100 mi. n. of Tokyo but generally applied to chief village of region, Hachi-ishi; religious center and tourist resort; noted for beautiful temples, tombs, and sanctuaries, and a sacred bridge
three wise monkeys, *picture* M-231
- Nikolaef (*nē-kō-lū'yēf*), or Nikolaev, Russia, fortified grain port on Bug River near Black Sea, 70 mi. n.e. of Odessa; pop. 165,000: *map* E-326e
- Nikolaevsk (*nē-kō-lū'yēf'sk*), seaport in e. Siberia at mouth of Amur R. on Sea of Okhotsk; improved harbor kept open all year by ice-breaker patrols; pop. 170,000: *map* A-332b
- Nikopol (*nē-kō-pōl*), Bulgaria. *See in Index* Nicopolis
- Nile, battle of (1798), French fleet destroyed by Nelson in Aboukir Bay N-63
- Nile River, longest river of Africa (4000 mi.) N-145-6, E-194-8, *map* E-197
archeology A-254: Philae ruins, *picture* E-210
Assuan Dam E-196, *picture* E-198, *table* D-357: dimensions C-16-17
canal to Red Sea C-67
crocodiles C-399
delta E-198
flood N-146, F-106d
irrigation E-196, *picture* E-198: primitive methods E-194, *picture* E-195
lower valley, *picture* P-372
source discovered N-146, V-297
water power, first use of W-49
- Niles, Mich., city on St. Joseph River 47 mi. s.w. of Kalamazoo in rich farm and fruit country; pop. 11,328; railroad shops; metal work, paper mills.
- Niles, Ohio, manufacturing center on Mahoning River 50 mi. s.e. of Cleveland; pop. 16,273.
- Nil'gai (*nīl'gī*), an Indian antelope, *picture* A-219
- Nilgiri (*nīl'gī-rē*) Hills, plateau in s. India; highest point 8760 ft.; forms district in Madras Presidency
people, *picture* I-34
- Nilson, Lars Fredrik (1840-99), Swedish chemist, discoverer of scandium.
- Nimbus, in art, the halo or disk of light surrounding head of a sacred personage.
- Nimbus, a cloud C-281
- Nîmes (*nēm*), city in s. France 60 mi. n.w. of Marseilles; pop. 95,000; silk trade and manufactures; wine and brandy market: *map* F-179
aqueduct A-236
Roman ruins F-178, *picture* F-170
- Nimitz, Chester W. (born 1885), naval officer, born Fredericksburg, Tex.; chief of the Bureau of Navigation 1939-41, earlier had commanded battleship and cruiser units of the U. S. Fleet; made commander in chief of the U. S. Pacific Fleet 1941.
- Nim'rod, in Genesis x, 8-9, a mighty hunter and founder of the Babylonian and Assyrian empires.
- Nimrud, Iraq. *See in Index* Kalah
- Nimwegen (*nīm'vā-jēn*), Holland. *See in Index* Nijmegen
- 'Niña' (*nēn'yā*), one of the three caravels of Columbus on his first voyage to America.
- Ninebark, shrubs (*Opulaster* or *Physocarpus*) of the rose family with lobed heart-shaped leaves and white or pink flower clusters which resemble spirea; bark becomes loose and shredded when old, separating into many thin layers; fruit, conspicuous red pods; often cultivated.
- "Nine-days' queen" G-178
- Ninepins, game B-207
- Nine-power Treaty, or Washington Treaty (1922) J-192, H-219
- Ninety-five theses, of Luther L-221
- Nineveh (*nīn'ē-vē*), capital of ancient Assyria N-146, B-8, *map* B-8
library L-103
- Nine Worthies, The, heroes popular in medieval art and stories: three Christians—King Arthur, Charlemagne, Godfrey of Bouillon; three Jews—Joshua, David, Judas Macabaeus; three paynims (or pagans)—Hector of Troy, Alexander the Great, Julius Caesar.
- Ningpo (*nīng-pō*'), China, treaty port 80 mi. s. of Shanghai on Ningpo River; pop. 220,000; commerce in tea, silk, cotton, carpets, fish, and sugar: *map* C-212
- Ningsia (*nīng'shyā*'), province of Inner Mongolia; pop. over 1,000,000: M-222b, *map* M-222c
- Ninus (*nī'nūs*), legendary founder of ancient Assyrian city of Nineveh.
- Nio (*nī-ō*'), modern name of ancient Ios, Greek Island, one of Cyclades in Aegean Sea, 13 mi. s. of Naxos; about 45 sq. mi.; according to tradition Homer is buried there.
- Niobe (*nī-ō-bē*), in mythology N-146
- Niobium. *See in Index* Columbium
- Niobrara River, Neb., rises in s.e. part of Wyoming, and flows east through n. Nebraska for 450 mi. into Missouri River: *map* N-57
canyons N-57
- Niort (*nī-ōr*'), France, town near La Rochelle; pop. 28,000; gloves.
- Nipa (*nē'pā*) palm, native of East Indies and Australia; leaves used for thatching; fruit edible; sugar and alcohol from juice; introduced into s. Florida.
- Nip'igon, Lake, in Ontario, 70 mi. long; discharges by Nipigon River into Lake Superior: *map* C-50c
archeological finds O-227
- Nip'issing, Lake, in Ontario midway between Georgian Bay and Ottawa River; 55 mi. long; link in proposed Georgian Bay Canal.
- Nipmuc (*nīp'mūk*), the Algonquian Indian tribes of central Massachusetts and extending into Connecticut and Rhode Island. They joined in King Philip's War in 1675 and at its close most of them fled to Canada or joined the Mahican and other tribes on Hudson River.
- Nip'pon, native name for Japan; means "land of the rising sun"; Dai Nippon, "Great Nippon."
- Nippur (*nīp-pūr*'), ancient city of Mesopotamia, 50 mi. s.e. of Babylon; flourished 4000 B.C.; excavated by University of Pennsylvania.
- NIRA (National Industrial Recovery Act) R-146f, h, i, j
combines permitted T-147
- Nirvana (*nīr-vā'nā*) B-259
- Nisel, name of Americans of Japanese ancestry N-12u
- Nish (*nēsh*), Yugoslavia, also Niš, Serbian town 130 mi. s.e. of Belgrade; pop. 35,000; ancient Naissus, birthplace of Constantine the Great; held by Turks 1456-1878; strategic value due to converging roads and railroads: *map* B-18
in 1st World War W-164
- Nishapur (*nīsh'ā-pūr*'), town in n.e. Persia; pop. 17,000: P-130
- Niska, a Chimmesyan Indian tribe living on Nass River and its tribu-

taries and on Nass Bay, British Columbia, Canada.
Ni'ter. See in *Index* Saltpeter
Niteroi (*nê-tê-roï'*), or **Nietheroy**, Brazil, capital of state of Rio de Janeiro, across the bay from city of Rio de Janeiro; noted for elegant suburban homes and fine bathing beaches; textiles, tobacco, soap; pop. 130,000: map B-226
Ni'ton, or radon, gaseous emanation of radium, discovered in 1900 by Dorn R-33, C-176, table C-168
 lightness, comparative G-18
Ni'trate, a salt of nitric acid containing the nitrate radical (NO_3) N-147
 ammonium nitrate A-188, N-148: in dynamite D-122
 bacterial formation P-243-4, N-147-8, A-117, picture C-282
 calcium S-18
 cellulose (nitrocellulose or pyroxylin) C-123, P-373
 Chile deposits S-18, C-207, picture C-207b
 cobalt, in invisible ink I-80
 fertilizers F-27, N-148
 film, for cameras C-123, M-280
 plants require P-243-4
 potassium S-18: in gunpowder G-188-9; mineral form M-183
 salt-peters S-18
 silver ("lunar caustic") S-152: in electroplating, picture E-226; mirrors silvered with M-199
 sodium S-18, M-183: fertilizer F-27, N-148
Nitric acid N-146-7. See also in *Index*
 Nitrate
 antidote F-64
 aqua regia contains G-114
 etching employs E-295, 298
 nickel dissolved by N-143
Nitric dioxide, or nitrogen peroxide, a reddish-brown gaseous compound (NO_2) N-147
Nitric oxide, compound of nitrogen and oxygen (NO), a colorless, poisonous gas, discovered (1772) by Priestley; important in nitrogen fixation: F-219, N-147
Nitrides N-148
Nitriding process, in case-hardening of steel I-146
Nitrifying bacteria N-147
Nitriles (*nî'trîlz*), in chemistry, cyanogen compounds with organic radicals; characterized by univalent group CN; usually liquid compounds with ethereal odor.
Nitrites, salts of nitrous acid (HNO_2) N-147
Nitrocellulose, cotton treated with nitric acid in varying degrees; principal types, collodion cotton, or pyroxylin, and gun-cotton: C-123
 collodion C-302
 derivatives, chart C-123
 pyroxylin products P-373, L-51, 52
 rayon, making R-55
 smokeless powder E-348
Ni'trogen, a gaseous element N-147-8, C-175, 168. See also in *Index*
 Nitrate; also headings beginning with Nitric, Nitro, and Nitrous
 air contains A-61, diagram A-62
 amino acids B-109
 ammonia A-188: one of chief nitrogen compounds N-147-8
 ammonium A-188, A-128: cyanate C-176a
 animals need N-147
 atomic structure, diagram A-361
 atomic weight C-167b
 case-hardening of steel requires I-146
 cycle P-239, N-147-8, pictograph P-238b
 electric lamp filled with E-234
 explosive compounds E-347-8
 fertilizers F-27, N-148

fixation N-147-8
 bacterial action N-147, P-243-4, B-112, S-191a-b: alfalfa roots A-117; clover C-281, picture C-282
 cyanamide process N-148, C-19
 electric arc process N-148, F-219
 Haber-Bosch process N-148
 lightness, comparative G-18
 liquefied L-155
 plants need P-243-4, N-147, picture P-235: fertilizers F-27
 proteins contain P-356, B-109
 protoplasm contains B-109
 pyroxylin products, use in P-373, L-51, 52
 specific gravity P-190
 symbol, chemical, picture C-167a
 urea C-176a
 valence C-170, diagram C-176a
Nitrogen cycle, in plant and animal life P-239, N-147-8, pictograph P-238b
Nitrogen-fixing bacteria N-147-8, P-243-4, pictures C-282, A-117
 alfalfa A-117
 azotobacter B-12
 clover C-281, picture C-282
Nitrogen peroxide. See in *Index*
 Nitric dioxide
Nitroglycerin, an explosive D-122, E-347, 348
Nitrous oxide, or "laughing gas" (N_2O), an anesthetic A-196, N-148
 discovery of properties A-196, D-21
 Nitti (*nê'tî*), Francesco Saverio (born 1868), Italian statesman and author; professor economics, University of Naples; served as minister of agriculture, industry, trade, treasury, and as premier, especially distinguishing himself on financial questions; bitterly opposed Fascism; left Italy 1924 as exile ("They Make a Desert"; 'Bolshevism, Fascism and Democracy').
Niue (*nê-g'ā*), or Savage, Island, dependency of New Zealand since 1901, in Pacific e. of Tonga Islands; 100 sq. mi.; pop. 4000; chief town Alofi; copra, bananas: map P-100
Nivelle, Robert Georges (1856-1924), World War general who rose from colonel in 1914 to commander in chief of the French armies in Dec. 1916; succeeded by Foch May 1917 after failure of spring offensive
 Chemin des Dames W-161, A-95
Nix'ies, water fairies F-3
Niza, Fray Marcos de. See Marcos
Nizam (*nî-zām'*), ruler of Hyderabad, India H-365, picture I-42
Nizhni Novgorod. See Gorky
NLRB (National Labor Relations Board) R-146g, L-45
Noah (*nō'ā*), in Genesis vi-ix, builder of the Ark, in which he and his family and one pair of every kind of animal were saved from the Deluge; ancestor of various races through his sons, Shem, Ham, and Japheth
 Babylonian legend B-9-10
 Mount Ararat A-332
Noailles (*nō-ī'yā*), Anna-Elisabeth, Comtesse Mathieu de (1876-1933), French poet and novelist F-198, 199
Nobel (*nō-bēl'*), Alfred Bernhard (1833-96), Swedish chemist and engineer
 dynamite invented D-122
 founds Nobel prizes N-148
 Nobel prizes N-148-9
Nobile (*nō'bē-lā*), Umberto (born 1885), Italian airship designer, aviator, and Arctic explorer; designed dirigibles *Norge* and *Italia*; dean aeronautics, Lewis Holy Name School of Aeronautics, Lockport, Ill. 1939-42: P-284
 Amundsen and A-190-1

Nobility, titles of. See in *Index* Titles of nobility
Noble fir, evergreen tree (*Abies nobilis*) of pine family, native from Washington to California. Grows 60 ft. to 200 ft. high; has rough red brown bark, rounded crown. Leaves rounded, gray green, to 1½ in. long, with white lines on both sides; cones to 10 in. long. Wood has reddish streaks; sometimes marketed as "white fir" and "larch."
Noble gases, term applied to helium, argon, and neon because they appear to be without affinity for other elements.
Noble metals, term sometimes applied to gold and platinum because of their extremely slight tendency to combine with other elements; silver, palladium, rhodium, mercury, aluminum, and even copper are sometimes included in the term.
Nocera (*nō-chā'rā*) Inferiore, Italy, city 20 mi. s.e. of Naples; pop. 23,000; linen and woolen manufactures.
Noche Buena (*nō'chā bwā'nā*), Spanish Christmas Eve festival C-229c
Nocturne, in music, a composition, generally for the piano, in a tranquil and dreamlike mood.
Noddack, Walter (born 1893) and **Ida** (born 1896), German chemists; with O. Berg, co-discoverers of masurium and rhenium.
Node, in astronomy, the two points where the orbit of a planet intersects the plane of the earth's ecliptic; one is the ascending, the other the descending node.
No drama. Japanese theatrical performance dating from 15th century; makes use of dialogue, music, dancing; of slow tempo, wearying to foreigner but of profound significance to its devotees: J-191
Noël (*nō-ēl'*), French name for Christmas C-226
Bonhomme Noël C-229b
 carols, or noëls C-227
Nofretete (*nō-fēr-tē'tē*), or Nefertiti, queen of Pharaoh Ikhenaton, picture A-250
Nogales (*nō-gā'lās*), Ariz., city on Mexican border (pop. 5135), separated by a street from Nogales, Mexico (pop. 14,000); port of entry for w. coast of Mexico; export and import trade; silver, copper, lead, and molybdenum in vicinity, also cattle raising: maps A-289, M-133
Nogi (*nō'gē*), Ki-Ten Marosuke, Count (1849-1912), Japanese general, victor of Port Arthur in Russo-Japanese War. He and his wife killed themselves, according to Samurai custom, at the time of Emperor Mutsuhito's funeral
 Russo-Japanese War R-198
Noguchi (*nō-gū-chē'*), Hideyo (1876-1928), Japanese physician and bacteriologist; came to U. S. 1901; on staff of Rockefeller Institute for Medical Research, 1904-28; noted for isolating a micro-organism supposed to cause yellow fever, but later found to cause a form of jaundice mistaken for yellow fever; died of yellow fever while studying the disease in Africa.
Nohl, Max E. (born 1910), American diving champion, born Milwaukee. Wis. D-72
Noire, famille, a Chinese porcelain P-331
Noise, loud or confused sound
 devices for broadcasting R-30, picture R-31
 distinguished from music S-195
 efficiency, effect on W-148

- Noko'mis, in Longfellow's poem, 'Hiawatha'; grandmother of Hiawatha, from whom he learned the legends of his race: L-194
- Nola (*nō'lā*), Italy, city 16 mi. n.e. of Naples; pop. 16,000; prominent in Roman times; Augustus died there 14 A.D.
- Nolan, Philip (died 1801), American filibusterer; led unsuccessful expedition into Spanish Texas (1799-1801) with Col. Ellis P. Bean.
- Nolan, Philip, hero of E. E. Hale's 'The Man Without a Country' H-199
- Nolana (*nō-lā'nā*), a genus of perennial plants of the nolana family, native to Chile and Peru. Low growing, creeping stems with long-stemmed, fleshy oval leaves; flowers blue, or purple, bell-shaped, similar to morning-glory; also called Chilean bellflower.
- Nolde (*nō'lād*), Emil (born 1867), German artist, identified with expressionists; early landscapes and flowers somber in color; later work robust and colorful; remarkable series of Biblical paintings.
- Nomadic life and peoples M-167, M-48, F-140-2
- Afghanistan A-30
- Arabs A-237, 238-9, pictures A-37, A-238, 239
- Arctic regions A-277
- Asia A-334, 330, 325
- Blackfellows, Australia A-372, pictures A-368, M-31, B-193
- gypsies G-90-1
- migrations caused by drought D-113b
- Mongols M-223-4, 222b-c
- Persia P-131, picture M-167
- Plains Indians I-54, 59, 62
- Semitic tribes B-5, J-215-16
- shelter S-111
- social organization F-10
- No Man's Land, unclaimed or disputed territory, particularly various borderlands; during 1st World War applied to land between front-line trenches of opposing forces.
- "No man so good was ever so bad a king" C-149
- Nom de plume (*nōn dū plüm*), a fictitious name, especially one used by writers; also called pen-name, or pseudonym.
- Nome (*nōm*), Alaska, gold-mining town and seaport in center of w. coast on Seward peninsula; pop. 1559 (was 20,000 during rush of 1890-1900); partly destroyed by fire 1934: map A-105
- Nomenclature, names or language used in any art or science.
- Nominal value, or par value, of stocks and bonds S-290
- Nominations, in U. S. politics P-292-3
- Nominative case, in grammar N-179
- pronouns P-351, 352
- Nonane, in chemistry. See in Index Paraffin series
- Nonelastic rocks R-121. See also in Index Limestone
- Non-combatants, status and rights in war time I-109
- Non-commissioned officers, in U. S. army A-307d
- insignia, pictures U-178
- Non-conductors, electric E-220, 221, 222
- Non-conform'ists, or Dissenters, those who refused to comply with usages of Church of England P-369
- New England colonized by A-151
- Nones (*nōnz*), in ancient Roman calendar the 9th day before the ides, falling in March, May, July, and October on the 7th of the month, in other months on the 5th: C-22
- Non-Euclidean geometry G-52
- Non-ferrous alloys A-131-2
- Non-Importation Act, U. S. (1806) E-258
- Non-importation agreements, in American colonies S-270
- Non-Intercourse Act, U. S. (1809) W-9
- Non-metals, in chemistry C-170
- Nonni (*nōn'nē*) River, Manchuria; rises in Great Khingan Mts. and flows 660 mi. to Sungari River: M-50, map M-49a
- Nonometer, line in poetry P-269
- Nonpareil, or painted bunting, a small bird of the finch family B-273
- Nonpareil (*nōn-pā-rēl'*) type T-172
- Non-Partisan League N-164
- Non-polar compounds C-173-4
- Noon-mark, in pioneer days, a line drawn on the floor of a cabin, marking one edge of the patch of light that came through an open door or window when the sun was due south. It told the noon hour and clocks were set by it.
- Noot'ka Indians, group of tribes of n. Pacific area, dwelling on Vancouver Island and in s. British Columbia and Washington; gave name to sound and island on w. coast of Vancouver Island.
- No'pal, a genus of the cactus family; resembles the prickly pear; grown as food for cochineal insects: C-291
- Nora Helmer, heroine of Ibsen's 'A Doll's House'.
- Nor'bert, Saint (died 1134), German ecclesiastic, archbishop of Magdeburg M-233
- Nordau (*nōr'dou*), Max (1849-1923), Jewish author and philosopher, born Hungary; leader in European Zionist movement ('Degeneration', criticism of modern civilization).
- Nordenskjöld (*nōr'dēn-shūld*), Nils Adolf Erick, Baron (1832-1901), Swedish Arctic explorer, first to accomplish (1878-80) the Northeast Passage from Atlantic to Pacific: map A-277
- Nordenskjöld, Otto (1869-1928), Swedish explorer, nephew of N.A.E. Nordenskjöld; after explorations in Patagonia, Alaska, and Greenland, led expedition to South Polar regions (1901-4); was rescued off coast of Graham Land by Argentine gunboat after own ship sank.
- Nordhoff, Charles Bernard (born 1887), author, born of American parents in London, England; married Pepé Tearai of Tahiti; lived in Tahiti after 1920; in collaboration with James N. Hall wrote 'Lafayette Flying Corps', 'Mutiny on the Bounty', 'Men Against the Sea', 'Pitcairn's Island', 'The Hurricane'.
- Nor'dica, Lillian (1859-1914), American operatic soprano, born Farmington, Me. (Marguerite in 'Faust'; Elsa in 'Lohengrin'); concert and operatic tours in every part of world; died in Java as result of exposure from shipwreck.
- Nor'dic race R-10
- racial affinity, diagram R-9b
- United States A-161
- Nördlingen (*nūrt'ling-ēn*), town in Bavaria, s. Germany, 70 mi. n.w. of Munich; in Thirty Years' War, scene of Imperialist victory over Swedes (1634) and defeat by French (1645).
- Norfolk, large county in e. England bounded n. and e. by North Sea; 2037 sq. mi.; pop. 322,000; capital Norwich; agriculture, textiles.
- Norfolk, Neb., commercial center for agricultural district; pop. 10,490; on Elkhorn River, 95 mi. n.w. of Omaha; railroad shops, bridge works, canning plants: map N-57
- Norfolk, Va., seaport on Elizabeth River, opposite Portsmouth; pop. 144,332: N-149, map V-306
- Tidewater Terminals, picture V-305
- Norfolk Island, isolated island 800 mi. e. of Australia, which governs it; 13 sq. mi.; pop. 1000; British cable station: map A-372a
- Pitcairn settlers removed to P-8
- Norfolk Navy Yard, at Portsmouth, Va., on Elizabeth River; builds and repairs all classes of naval vessels. See also in Index Portsmouth, Va.
- Normal, Ill., town 2 mi. n. of Bloomington; pop. 6983; Illinois State Normal University.
- Normal schools E-186, V-314
- first state normal school E-178
- Normal solutions, in chemistry A-10
- Norman, Montagu Collet (born 1871), British financier; became governor of the Bank of England in 1920 and held that office longer than any predecessor.
- Norman, Okla., stock-raising and agricultural center 20 mi. s. of Oklahoma City; pop. 11,429; University of Oklahoma: map O-216
- Norman architecture A-264
- Norman Conquest (of England) W-101, E-270-1
- battle of Hastings H-233-4
- effect on English language E-282, 283
- 'Normandie', an ocean liner S-128, pictures S-117, 126
- Nor'mandy, province of France on English Channel N-149, map F-179
- Channel Islands once part of C-139
- cheese making C-165
- folk-dance, picture F-133
- history N-149: Northmen settle N-168; William the Conqueror W-101
- Normans N-168, N-149, picture A-305
- Norns, in Norse mythology, the three giant goddesses who preside over the fates of both men and gods (Urd, personifying the past; Verdandi, the present; Skuld, the future); Asgard was their home.
- Norridgewock, division of the Abnaki group, of Algonquian stock; lived in Canada and Maine.
- Norris, Charles Gilman (born 1881), American novelist, born Chicago; husband of Kathleen Norris and brother of Frank Norris; did journalistic work in New York; novels deal with problems of modern life ('Salt'; 'Brass'; 'Bread').
- Norris, Frank (1870-1902), American novelist, born Chicago ('The Octopus' and 'The Pit', the first and second parts of an unfinished trilogy, 'The Epic of Wheat').
- Norris, George William (born 1861), American legislator, born Sandusky County, Ohio; U. S. representative and from 1912 to 1942 senator from Nebraska; nominally a Republican but noted for independence of party ties; fought for reform of House rules; voted against U. S. entrance into 1st World War; denounced Versailles treaty; fought for farm relief legislation
- "lame duck" amendment H-338
- Norris, Kathleen (born 1880), American novelist, wife of Charles G. Norris; born San Francisco, Calif.; at age of 19 lost both parents and was left with great domestic and financial responsibility; stories popular for their wholesome attitude toward life and understanding of women ('Mother'; 'Certain Peo-

NORRIS DAM

ple of Importance'; 'Noon'; 'Barberry Bush'; 'Mother and Son').
 Norris Dam T-49, table D-357
 Norris-La Guardia Federal Anti-Injunction Law L-44c
 Norristown, Pa., borough 14 mi. n. w. of Philadelphia on Schuylkill River; pop. 38,181; iron, marble, limestone, and sandstone in vicinity; textile machinery, hosiery, steel, iron products, cigars: map P-112
 Norrköping (*nör'chüp-ing*), Sweden, seaport on s.e. coast 80 mi. s.w. of Stockholm; pop. 67,000; important trade and manufactures: map N-173
 Norrland, province of n. Sweden S-337-8
 Norse language. *See in Index* Scandinavian languages
 Norsemen. *See in Index* Northmen
 Norse mythology, Outline M-329-30
 Edda S-36
 North, Christopher, pen name. *See in Index* Wilson, John
 North, Frederick, Baron (1732-92), later Earl of Guilford (better known as Lord North), British statesman; as king's agent (disclaimed title of prime minister) introduced Boston Port Bill, 1774, and against own conviction, supported George III's policies which led to American Revolution: R-83, 86, 89
 offers peace R-92
 North, Sir Thomas (1535?-1601?), English translator of Plutarch from the French version by Amyot (first edition 1579), vigorous style greatly influenced English prose; Shakespeare took whole speeches in 'Julius Caesar' and other plays directly from North's 'Plutarch'.
 North Adams, Mass., city on Hoosac River 50 mi. n.w. of Springfield; in Berkshire Hills near w. end of famous Hoosac Tunnel; pop. 22,213; textile printing, cotton and woolen mills, electrical specialties, shoes; state teachers college; site of old Ft. Massachusetts: map M-82
 North America, the 3d largest continent; 9,400,000 sq. mi.; pop. 185,000,000: N-150-5, maps N-150a, b-c, S-205b, Outline N-153-5. *See also in Index* America, discovery and exploration; Canada; Central America; Mexico; United States; also natural features by name animals, Outline N-154
 Arctic regions N-151-2, A-277-8
 bibliography N-155
 climate C-270a-b, N-152-3, Outline N-153: rainfall, map N-150a
 coast line and harbors N-150, N-153 compared with other continents
 N-150: elevation, chart P-201; South America S-205a-b, N-150
 discovery and exploration, Outline N-154
 elevation, chart P-201, map N-150a
 extent N-150
 food plants, native A-149, F-142
 geographic influences on settlement N-150-1: United States U-183-6, A-230; Virginia V-303-4
 geologic history N-152-3: ice age I-2-3, M-191, L-195; Lake Agassiz P-200; land bridge to Asia, evidence A-102-3
 mountains N-151, 152-3, list N-150
 peoples, Outline N-154. *See also in Index* Indians, North American plains P-200
 political divisions, list N-150
 population density, map N-150a
 products and resources N-151-2: coal C-284; fisheries F-79, T-154-5, U-195; forests L-212, 218; min-

Fact-Index

erals N-151, 152; petroleum P-152; wheat W-81, 82, 83-4
 rivers and lakes N-151, list N-150, Outline N-153
 vegetation, map N-150a, Outline N-153
 North American Regional Broadcasting Agreement R-26
 Northampton (*nörth-ämp'ton*), England, city 60 mi. n.w. of London on Nene River; pop. 92,000; shoe manufactures; capital of Northamptonshire; battle 1460 in which Yorkists captured Henry VI: map E-270a
 Northampton, Mass., city 18 mi. n. of Springfield on Connecticut River; pop. 24,794; Smith College; silk, hosiery, brushes, cutlery; settled 1654: map M-82
 Northamptonshire, an e. midland county of England; 909 sq. mi.; pop. 217,000; capital Northampton; cattle-raising, shoe manufacturing.
 North Anna, stream n. of Richmond, Va.; reconnoitering engagements May 23-5, 1864, between Grant and Lee, followed by Federal outflanking maneuver toward Cold Harbor: map C-253
 North Attleborough, Mass., town 29 mi. s.w. of Boston; pop. 10,359; silverware, tennis rackets, jewelry, optical goods, iron castings.
 North Australia, an administrative division of Australia from 1926 to 1931 at which time it was reunited with Central Australia to form the Northern Territory.
 North Battleford, Saskatchewan, Canada, manufacturing city 222 mi. n.w. of Regina at junction of Saskatchewan and Battle rivers; pop. 4719; grain elevators, creameries: map C-50b
 North Bay, Ontario, Canada, lumbering, mining, and railroad town about 200 mi. n.w. of Ottawa on Lake Nipissing; pop. 15,528; planing and saw mills, car repair and machine shops: map C-50c
 North Braddock, Pa., residential and manufacturing suburb 8 mi. s.e. of Pittsburgh; pop. 15,679; extensive steel rail works.
 Northbridge, Mass., town 12 mi. s.e. of Worcester on Mumford River; pop. 10,242; textiles, textile machinery, embossed paper, silk.
 North Cape, Arctic island on n. coast of Norway; from here tourists view the midnight sun; generally known as the northernmost point of Europe, although Knivskjaerodden, an island about 47 mi. to the n.w., is actually farther north: map N-173
 North Carolina, a s. Atlantic state of U. S.; 52,712 sq. mi.; pop. 3,571,623; cap. Raleigh: N-155-60, maps N-156, U-188c
 agriculture N-156-7
 bird, state B-122
 cities N-158, list N-155. *See also in Index* names of cities
 climate N-155
 cotton mills N-157
 education N-160
 flag F-92, color plate F-87
 flower, state S-279
 forests, national and state, table F-250
 government N-160
 history N-158-60
 Revolutionary War R-91, N-159-60
 Mecklenburg Declaration of Independence N-159
 Declaration of Independence D-28, N-159
 Tennessee region N-160, S-85, T-48
 library movement L-106b
 manufactures N-157-8
 name, origin of, and nickname S-279

NORTHEAST PASSAGE

national parks N-22a, f, G-150b-51
 natural features N-155-6, A-230
 presidents from N-160
 products N-156-8, chart N-156, list N-155: emeralds G-28; mica M-145; tobacco T-102
 North Carolina, University of, state institution consisting of the University at Chapel Hill (chartered 1789, opened 1795), State College of Agriculture and Engineering at Raleigh, and Woman's College at Greensboro; consolidated 1931.
 North Carolina College for Negroes, at Durham, N.C.; state institution founded 1910; arts and sciences.
 North Carolina pine, a common name sometimes applied to the loblolly and shortleaf pines. *See in Index* Shortleaf pine
 North Central Association of Colleges and Secondary Schools C-301
 library requirements L-106i
 North Central College, Naperville, Ill.; formerly Northwestern College (name changed 1926); Evangelical; founded 1861; liberal arts, commerce, home economics, music.
 North Central States, in U. S., Outline U-203-4
 Northcliffe, Alfred Harmsworth, first Viscount (1865-1922), English newspaper proprietor, one of the most powerful figures in 20th-century journalism; owner of London Times, Daily Mail, Evening News, etc., and founder of the Amalgamated Press, the world's largest periodical publishing business; during 1st World War exerted immense influence on public opinion and government policies; supported Lloyd George; chairman of British War Mission to U. S. 1917.
 Northcote (*nörth'cöt*), James (1746-1831), English historical and portrait painter and author; paintings include 'The Murder of the Princes in the Tower' and 'The Death of Wat Tyler'.
 North Dakota, a plains state of n.w. U. S.; 70,665 sq. mi.; pop. 641,935; cap. Bismarck: N-161-5: maps N-162, U-188b-c
 bird, state B-122
 cattle ranges C-108, 115
 cities N-164, list N-161. *See also in Index* names of cities
 climate N-162
 education N-164
 flag F-92, color plate F-87
 flower, state S-279
 forests, national and state, table F-250
 government N-164
 history N-164-5
 immigration N-164
 Lake Agassiz (extinct) P-200
 legislative experiments N-164
 Lewis and Clark expedition L-99
 name, origin of, and nickname S-279
 natural features N-161-2: Red River R-62
 Non-Partisan League N-164
 products N-162-4, chart and list N-161: flax F-106
 Verendrye national monument N-22e
 North Dakota, State University of, at Grand Forks, N. D.; established 1883; liberal arts, law, engineering, education, commerce, medicine: picture N-163
 North Dakota Agricultural College, at Fargo, N. D.; state control; opened 1891; agriculture, chemistry and technology, education, home economics, mechanic arts, pharmacy, science and literature.
 Northeast Passage, a passage by sea to the Orient around northern Europe and Asia; attempted by explorers from 16th century on;

- finally accomplished 1880 by Baron Nils Nordenskjöld. The modern northeast passage is the Northern Sea Route between Archangel and Vladivostok, Siberia: *map A-277*
- Norther, cold wind from north or northwest W-113
- Northern Cross. *See* Cygnus
- Northern Crown, or Corona Borealis, a constellation in the northern sky, *charts S-275d, g*
- Northern Fur Seal S-70
- Northern Hemisphere. *See* Hemisphere
- Northern Ireland (Ulster), a part of the United Kingdom with a separate parliament; 5,237 sq. mi.; pop. 1,280,000; cap. Belfast: I-129
- Belfast B-85, I-129
- government I-129, G-144
- history I-128, 129
- Northern Land, U.S.S.R. *See* Severnaya Zemlya
- Northern lights, or aurora borealis A-365, *picture A-366*
- Labrador L-46
- Northern muskellunge P-218
- Northern Pacific Railroad R-37
- effect on Washington W-32
- Roosevelt breaks merger R-151
- Northern Rhodesia. *See* Rhodesia
- Northern sea-lion S-70
- Northern Securities Case, U. S. (1904) R-151, U-212
- Northern Sporades, group of Greek islands off e. coast of Greece: Syros chief island: *map B-18*
- Northern Territory, the n. cent. part of Australia; 523,620 sq. mi.; pop. (white) 5000; cattle raising, gold and tin mining: *map A-372a*
- Northern Territories, a British protectorate, part of Gold Coast country in w. Africa; administration headquarters Tamale; 30,486 sq. mi.; pop. about 718,000: *map A-42a. See also* Gold Coast
- Northern War (1700-21), between Charles XII of Sweden and Denmark, Russia, and Poland C-154, P-143
- Northern white cedar, or American arborvitae, an evergreen tree (*Thuja occidentalis*) of the pine family native from Manitoba to Quebec and s. to Tennessee. Average height 60 ft.; slow-growing; narrow crown; leaves yellow-green, in flat sprays; cones $\frac{1}{2}$ in. long, pale brown. Many varieties. Oil distilled from leaves is used in insecticides and liniments. Sometimes called arborvitae, white cedar, swamp cedar, or cedar.
- Northern white pine. *See* White pine
- Northfield, Minn., city 35 mi. s. of St. Paul in agricultural and dairying region; pop. 4533; Carleton College, St. Olaf College.
- North German Confederation (1866-70) G-73
- North German Lloyd Steamship Company, a German steamship line, operating between Europe and America, Australia, and the Far East; founded at Bremen, 1857; American interests merged with Hamburg-American line in 1934.
- North Holland, a province of the Netherlands H-323
- North Island, 2d largest island of New Zealand; 44,281 sq. mi.; pop. 1,020,000: N-135, 136, *maps A-372a, P-10b*
- North Little Rock, Ark., suburb of Little Rock on opposite side of Arkansas River, formerly called Argenta; Missouri Pacific railroad shops; pop. 21,137: *map A-296*
- North magnetic pole, of earth E-132, M-34, *maps A-277, C-327*
- aurora borealis and, *picture A-366*
- compass points to C-326
- explorers locate P-280: Amundsen A-190
- North Manchuria Railway, formerly Chinese Eastern Railway C-221m, M-49b
- Northmen, Norsemen, or Vikings N-166-70
- America discovered A-141, N-168
- England invaded by Danes E-270: Alfred the Great checks A-118; Canute C-79
- Greenland discovered G-176, N-168
- Ireland invaded C-366
- Italy invaded N-4-5, R-145
- literature S-36
- Normandy settled N-149, N-168
- origin of name Vikings N-168
- raven flag F-99, *color plate F-90*
- remains in Ontario O-227
- Scotland invaded T-81: Hebrides H-267; Orkneys O-251; Shetland Islands S-116
- ships N-166, S-118, *pictures N-168, S-125*
- North Mountains. *See* Kittatinny Mountains
- North Park, plateau in n. Colorado C-311, *map C-310*
- North Plainfield, N. J., residential suburb of New York City; pop. 10,586.
- North Platte, Neb., trade center of agricultural region at junction of N. and S. Platte rivers; pop. 12,429; railroad repair shops; flour-milling, meat-packing, poultry and dairy products: *map N-57*
- North Platte River, rises in Rocky Mts. in North Park, Colo.; crosses Wyoming and unites with s. fork to form Platte River in n.w. Nebraska; 750 mi.: *map W-194*
- irrigation project N-53, I-149, W-194
- North Pole, the northern extremity of earth's axis, *maps A-277, A-190*
- airplane base P-285
- compass variation C-326
- discovery P-282, P-98. *See also in Index* Polar exploration
- magnetic E-132, P-280, A-190, M-34, *maps A-277, C-327*: aurora borealis and, *picture A-366*
- movement due to precession of equinoxes E-135, *diagram E-134*
- star chart S-275a
- North Rhodesia. *See* Rhodesia
- North River, lower course of Hudson River N-123
- North Sea, the part of the Atlantic between Great Britain and continent of Europe N-170, *map E-326d. See also* Ocean, table
- fisheries N-170, E-318
- mine barrage T-114-16, N-170: trawlers F-78
- North Star, also Pole Star, or Polaris, star nearest in line above North Pole S-274, *charts S-275, 275a, f, g*
- latitude determined by N-46
- located by "Dipper," *picture A-341*
- navigation by N-49
- use in telling time, *picture A-341*
- North Sydney, Nova Scotia, town on Sydney Harbor, Cape Breton Island, 5 mi. n. of Sydney; pop. 6139; fine harbor; fishing center.
- North Tonawanda, N.Y., manufacturing city 10 mi. n. of Buffalo on Niagara River, opposite Tonawanda, and on Erie Canal; pop. 20,254; lumber, iron: *map N-114*
- North Truchas Peak, peak of Rocky Mts. in New Mexico (13,306 ft.).
- Northumberland, John Dudley, Duke of (1502-53), English statesman, an unprincipled and subtle intriguer; controlled government during part of reign of Edward VI; executed following plot to put Lady Jane Grey on throne: G-178
- Northumberland, large county in extreme n.e. of England; 1999 sq. mi.; pop. 409,000; sheep-raising, coal and iron mining; chief city, Newcastle-upon-Tyne.
- Northumbria (*nôth-ûm'bri-d*), ancient kingdom in n.e. England, most powerful on island in 7th century; made tributary to Wessex in 827.
- North Vancouver, B. C., city on n. shore of Burrard Inlet, opposite city of Vancouver; pop. 8510; ships lumber and shingles, oil; tourist center: *map C-50b*
- Northwest, in U.S. *See* Far West
- Northwest Angle, part of Minnesota, and the northernmost point of the United States; formed where the United States-Canadian boundary slants abruptly up and back through the Lake of the Woods cutting off a promontory on the lake's western shore. The promontory (area about 150 sq. mi.) can be reached only by water or by crossing Canadian territory. Result of geographic error when boundary was defined in 1783.
- Northwestern University, at Evanston, Ill.; Methodist board; opened 1855, chartered 1851; liberal arts, medicine, law, dentistry, music, speech, education, engineering; Garrett Biblical Institute; colleges of law, medicine, dentistry, commerce, and liberal arts in Chicago
- Technological Institute, *picture E-181*
- Northwest Frontier Province, northernmost province of India; consists of British Indian area created 1901 (13,518 sq. mi.; pop. 2,425,000) and of agencies and tribal areas (22,838 sq. mi.; pop. 2,260,000): I-30, *map I-31*
- North-West Fur Company (sometimes called "The Nor'westers") F-226
- Fort William founded F-161
- Manitoba M-54
- rivalry with Hudson's Bay Company F-226-7, H-350
- North West Mounted Police, former name of Royal Canadian Mounted Police P-288
- Northwest Nazarene College, at Nampa, Idaho; founded 1913 by Nazarene church; arts and sciences.
- Northwest Passage C-59, A-144-5, *map A-143*
- Amundsen P-284, A-190
- Franklin, Sir John P-280
- Frobisher P-280
- Hudson H-348
- McClure P-280
- Northwest Territories, Canada N-170, C-51, *map C-50b-c*
- Hudson's Bay Company H-350
- police system P-288
- Northwest Territory, region in U. S. n. of Ohio River from which Ohio, Indiana, Michigan, Illinois, and Wisconsin, were formed: N-170-1
- Articles of Confederation, Maryland opposes A-318, N-170
- Clark's part in winning C-259
- favors strong federal government U-206
- Harrison's administration of H-231-2
- Indian conquest W-19
- New York cedes claim N-118
- Ohio River avenue to O-215
- Ordinance of 1787 N-171: Jefferson plans J-208
- pioneers in P-221e-f
- states organized from: Illinois I-18; Indiana I-45; Michigan M-154; Ohio O-214; Wisconsin W-126
- Tecumseh's uprising T-27-8, H-232
- Northwich, England, town 20 mi. s.e. of Liverpool; pop. 18,000; salt mines.

Norton, Caroline Elizabeth Sarah (1808-77), English novelist and poet, granddaughter of Richard Brinsley Sheridan; model of the witty heroine in Meredith's 'Diana of the Crossways'. She and her sisters were called the "three graces" of London society.

Norton, Charles Eliot (1827-1908), American scholar and author, born Cambridge, Mass.; foremost American Dante scholar (prose translation of Dante's 'Divina Commedia').

Norton, Thomas (1532-84), English lawyer, politician, and poet; wrote, with Earl of Dorset, 'Gorboduc', earliest English tragedy.

Norwalk, Conn., city on Long Island Sound, 40 mi. n.e. of New York City; pop. 39,849; rubber products, hats, underwear, hardware, lace, shoes; oyster culture; burned by British and Hessians in Revolutionary War: map C-336

Norway, a kingdom of n.w. Europe, in w. part of Scandinavian peninsula; 125,000 sq. mi.; pop. 2,815,000; cap. Oslo: N-171-8, maps E-326c, d-e, f, 318a, N-173, Outline S-341

agriculture N-172, 174, 176; cooperative A-58; dairying N-176

Antarctic claims F-286 bibliography S-341

Christmas customs C-226-7, 229a cities N-174, 176, list N-172. See also in Index names of cities climate N-172, 176; rainfall, map E-318a

commerce N-178, table C-480: ships, tonnage S-129

education N-178; illiteracy P-304d emigration to U. S. I-22, 23

floods N-171-2, 174, picture N-176 fishing N-174-6, 178, F-81, pictures N-177, N-178; whaling W-80

flag F-96, color plate F-89 folk-tales S-303e-f: list S-303m-n

forests N-174, 178 government N-178 history N-178

Northmen N-166-70 Canute, ruler C-79

Greenland colonized G-176 Iceland I-6

Haakon IV invades Scotland T-81 Union of Kalmar D-53

Charles XII attempts to conquer C-154

German invasion (1940) N-178, W-178g-h

holidays: Independence Day H-322; St. Olaf's Day H-323

language and literature S-36; Björnson B-152; folk-tales S-303e-f, S-303m-n; Ibsen I-2

manufactures N-178 music: Grieg G-178

national songs N-26 natural features N-171-4: "drowned coast" I-2b; elevation, map E-318a

North Sea N-170 Oslo O-252

people N-172, 174, pictures N-175, 177; Lapps L-64

population density, map E-318a postal service, picture P-316

products, list N-172 shelter N-174, pictures N-175, 177

ships: tonnage S-129 sports N-172, 174, picture N-174: skiing W-116

Svalbard, islands in Arctic Ocean N-176

transportation and communication N-178

vegetation, map E-318a

Norway Deep, in North Sea N-170

Norway maple M-56

Norway pine P-220, 221

Norway spruce S-264

hedges H-269

Norwegian rat R-51

"Nor'westers, The," See in Index North-West Fur Company

Norwich (*nôr'wich*), Conn., manufacturing and trade center at head of navigation on Thames River, 35 mi. s.e. of Hartford; pop. 23,652; extensive waterpower; paper, textiles, leather goods, thermos bottles; settled 1659: map C-336

Norwich (*nôr'ich*), England, manufacturing and trade center, capital of Norfolk County on Wensum River near North Sea, 100 mi. n.e. of London; pop. 126,000; fine Norman cathedral; importance dates from Middle Ages: map E-270a

Norwich University, at Northfield, Vt.; founded 1819; for men; stresses military training; arts and sciences, chemistry, engineering.

Norwood, Mass., town 14 mi. s.w. of Boston; pop. 15,383; printing plants; leather, roofing materials.

Norwood, Ohio, suburb n.e. of Cincinnati; pop. 34,010; laundry machinery, office furniture, playing cards.

Nose

bones of S-156

breathing H-374, R-79-80

smell S-164

Nosebleed, treatment for F-66

Nostradamus (Michel de Notre-dame) (1503-66), French astrologer, born at Saint-Remy in Provence, of Jewish parents who were later converted to Christianity; studied medicine; claimed he could foretell events, and in 1550 began writing his 'Centuries', a series of mystic prophecies; Catherine de' Medici called him to her court.

Notary public, an officer authorized by the state to attest or certify legal documents.

Nota'tion, in arithmetic A-285, N-184-5

Arabic system, importance of E-171

Notation, in color C-308d

Notation, in music M-318-19

Greek M-309

Note, financial, a credit instrument C-392

interest, calculating P-121-2

mortgage C-394, 392, S-291

promissory: negotiable C-394; when not commercial, paper C-393

short term security S-291

Note, a musical sound, physical nature of S-195

No'tochord, a gristly backbone V-290, Z-229

Notredame (*nôt'rüdäm*), Michel de. See in Index Nostradamus

Notre Dame, cathedral at Antwerp A-225, picture B-89

Notre Dame, cathedral of Paris; beautiful example of early Gothic architecture; situated on Île de la Cité, a small island in Seine River; construction begun by Bishop Maurice de Sully in 12th century; completed 1304; twin towers never finished: pictures A-266, 267

Notre Dame, University of, at Notre Dame, Ind., near South Bend; Roman Catholic institution for men; founded 1842; arts and science, commerce, engineering, architecture, law football history F-151d

Notre Dame College, at South Euclid, Ohio; Roman Catholic institution for women, founded 1922; arts and sciences.

'Notre Dame de Paris' ('The Hunchback of Notre Dame'), prose romance by Victor Hugo built around love of Quasimodo, the

hunchback, for Esmeralda, a street dancer; vivid picture of medieval Paris.

Notre Dame of Maryland, College of, at Baltimore, Md.; Roman Catholic institution for women, founded 1895; arts and sciences.

Nott, Eliphalet (1773-1866), American educator and inventor; born Ashford, Conn.; president Union College; invented base burner for stoves: picture I-115

Not'tingham, England, city 110 mi. n.w. of London on Trent River; pop. 270,000; center of lace and hosiery manufactures; Arkwright built first spinning mill here, and Hargreaves a yarn mill: map E-270a

first machine-made lace L-47

Nottingham, Sheriff of, and Robin Hood R-119

Nottinghamshire or Notts, county in central England; 827 sq. mi.; pop. 444,000; capital Nottingham.

No'tus, in Greek mythology, the south wind A-27

"Not worth a Continental" M-220b

Noun N-179

infinitive or participle V-282

phrase and clause S-79

relation to verb V-281, S-78

Nourse, Joel, American inventor, born Shrewsbury, Mass.; perfected cast-iron plow, 1842, which he manufactured at Worcester, Mass.: A-49

Novachord, electric musical instrument invented by Laurens Hammond; similar in appearance to spinet; tones produced by vacuum tube oscillators and resemble those of harpsichord, violin, trumpet, and guitar.

Novac'ulite, fine-grained rock made of quartz particles

Arkansas deposits A-295

Novae (*nô've*), or new stars S-275

Novaes (*nô-vâ'äs*), Guiomar (born 1895), distinguished pianist, born in Brazil; graduated Paris Conservatory; concert appearances Europe and Brazil; made her debut in New York City 1915.

Nova Goa. See in Index Panjim

Novalis (*nô-vä'lis*), pen name of Friedrich Leopold, Freiherr von Hardenberg (1772-1801), German romantic poet and novelist ('Hymns to Night').

Nova Lisboa (*nô'vá lêzh-bô'dä*), formerly Huambo (*väm'bô*), capital of Portuguese colony of Angola; pop. 4000: map A-42a

Novara (*nô-vä'ra*), railroad center in n. Italy 30 mi. w. of Milan; pop. 64,000; textile manufactures; scene of battle (1849) in which Charles Albert was defeated by the Austrians.

No'va Scotia (*skô'shâ*), a maritime province of Canada; 21,068 sq. mi.; pop. 512,846; cap. Halifax: N-179-80, map C-50c

Acadia its original name A-4

Bay of Fundy T-91, picture T-92

Cape Breton Island C-79-80, N-22f

codfish drying yard, picture C-55

Halifax H-200-1

libraries L-106n

Sir Charles Tupper T-155

Nova Scotia Agricultural College, at Truro, N. S.; provincial institution; opened as school 1885; reorganized as college 1905.

Novaya Zemlya, also Nova Zembla, "new land," two islands in Arctic Ocean belonging to Russia; 35,000 sq. mi.: maps A-277, A-332b

Novel N-181-4. See also in Index names of novelists

American A-177, 179, 180, 181, N-183

Key—cäpe, ät, fär, fäst, whät, fäll; mä, yët, fêrn, thêre; îce, bît; rôw, wôn, fôr, nôt, dg; cûre, bût, ryde, fyll, bárn;

authors' royalties B-191
 Bunyan's influence B-275-6, N-181
 children's literature L-162-3
 Chinese C-221g
 English N-181-3, E-285, 286, 287-9
 French N-183
 historical, created by Scott N-182, S-49, 50
 how to judge N-184
 Latin American L-67g
 romance distinguished N-181, R-127-8
 Russian R-197, N-183
 Scandinavian S-36
 Spanish S-236, 237
 western stories F-13, 17
 Novella N-181, 183
 'Novels', of Justinian J-231
 November N-184
 birthdays of famous persons. *See in Index* Anniversaries and birthdays, *table*
 birthstone G-25
 holidays H-321, 322; foreign H-323
 Novena, in Roman Catholic church, nine days of devotion, public or private, to obtain special graces; adopted from Apostles' nine days of prayer between Ascension and Pentecost.
 Novgorod (*nov'gō-rōd*), historic town in w. Russia 100 mi. s. of Leningrad near n. end of Lake Ilmen; pop. 38,000; cap. of 9th century Russian kingdom; great trade center in Middle Ages
 conquered by Ivan III I-175
 Novibazar (*no-vē-bā-zār*), or Novipazar, Yugoslavia; trade center for agricultural section, also an important industrial and publishing city; pop. 11,000; historical background: *map* B-18
 Novi Sad (*no'vō-sād*), German Neusatz (*no'zāts*), Hungarian Óvidék (*o'vī-dāk*), Yugoslavia, city in n. on Danube River, in former Hungarian district of Vojvodina; pop. 64,000; *map* E-326d-e
 Novitiate (*no-vish'i-āt*), or noviceship, in religious community M-236
 Novocaine (*no'vō-kān*), a local anesthetic A-197, B-111
 Novorossisk (*no-vō-rō-sēs'k*), Russia, seaport on n.e. coast of Black Sea; pop. 95,000; commerce in naphtha, cement, tobacco: *map* E-326e
 Novosibirsk (*no-vō-sē-bēr'sk*), capital of West Siberian Region, U.S.S.R.; pop. 405,000; junction of Trans-Siberian Railway and line to Turkistan; iron and steel, lumber, flour: S-138, *map* A-332b
 No'vum Or'ganum ("new method"), philosophical work in Latin by Francis Bacon, which treats of the inductive method of reasoning; published in 1620.
 Nox, in Roman mythology, goddess of night, corresponding to Greek Nyx.
 Noyes (*noiz*), Alfred (born 1880), English poet, born in Staffordshire; educated at Oxford; shows technical skill in different meters; virile, patriotic note in much of his work ('Tales of the Mermaid Tavern'; 'Drake', an English epic; 'The Wine-Press'; 'The Torch-Bearers'; 'Robin Hood', poetic drama).
 Noyes, Arthur Amos (1866-1936), American chemist, born Newburyport, Mass.; in chemistry department at Massachusetts Institute of Technology until 1915, then at California Institute of Technology; made important contributions to physical chemistry.
 Noyes, John Humphrey (1811-86), American Congregational minister, founder of Oneida Community; born

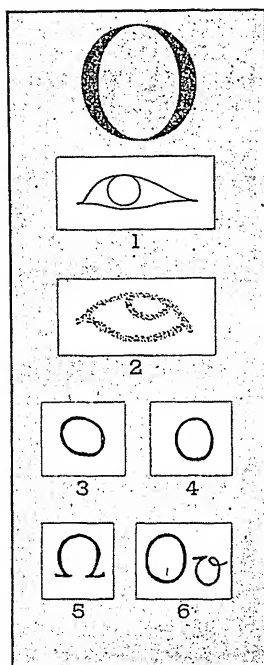
Brattleboro, Vt. *See in Index* Oneida Community
 Noyon (*noū-yōn*), historic town 60 mi. n.e. of Paris; pop. 6000; Charlemagne crowned king in 768; birthplace of Calvin.
 NRA (National Recovery Administration) R-146f-j
 Nu'bia, region in Africa, s. of Egypt, in the Anglo-Egyptian Sudan, including Nubian Desert: E-195-6
 conquered by ancient Egypt E-206
 Nubian Desert, great desert in Africa between Red Sea and w. bend of Nile River S-4, *map* E-197
 Nucleus (*nū'klē-ūs*), of cell C-122
 amoeba A-189, *pictures* A-188
 cell division H-283-4, *pictures* H-285, B-113
 Nucleus, of chemical atom A-360, 361, 362, C-169
 helium evolved by, in radioactivity R-32
 Nucleus, of comet C-320
 Nueces (*nuā'sēs*) River, in s. Texas, 400 mi. long, entering Gulf of Mexico through Corpus Christi Bay: *map* T-56
 Texas boundary dispute P-296
 Nueva Esparta (*nuā'vā ēs-pār'tā*), island group in Caribbean Sea, a state of Venezuela; cap. La Asunción: *table* W-72e
 Nuevo León (*no'vū'vō lā-ōn*), Mexico, state in n.e.; 25,134 sq. mi.; pop. 415,000; cap. Monterrey.
 Nullification, in American history, suspension of a federal law by a state S-279-80. *See also in Index* States' Rights
 Calhoun's stand C-24-5
 Clay's stand C-262
 Jackson opposes J-179, S-280
 Webster on W-62
 Numa Pompilius (*nū'mā pōm-pil'i-ūs*), 2d legendary king of Rome R-129
 Number, in grammar
 nouns N-179
 pronouns P-352
 verbs V-281
 Numbers N-184-5. *See also in Index* Arithmetic
 in arithmetic A-285
 large, simplified by exponents S-242
 origin and use A-285-6
 Pythagorean doctrine of P-374
 Numbers, Book of, fourth Book of Old Testament, so called because it begins with account of census; includes part of history of Israelites during their wanderings.
 Num'erals N-184-5, A-285
 Arabic system, importance of E-171
 Numidia (*nū'mīd'i-ā*), ancient kingdom and Roman province in n. Africa corresponding nearly to modern Algeria.
 Numismat'ics, the science of coins and medals. *See* Coins; Medals
 Nu'mitor, in Roman legend, king of Alba Longa, ancestor of Romulus and Remus R-146
 Nummullto (*nūm'ū-lit*) (from Latin *nummus*, coin), a genus of *Foraminifera*, practically extinct, whose many-chambered spiral shells, resembling coins, form bulk of Tertiary limestone found in various parts of the world.
 Nun M-236. *See also in Index* chief orders by name
 Juana Inés de la Cruz, *picture* L-67h
 Nunc Dimittis (*nūngk dī-mīt'is*) ("Now Thou lettest depart"), the song of Simeon (Luke ii, 29-32), part of the liturgy of the Roman Catholic and Anglican churches; so named from the opening words in the Latin version of the song.

Nuncio (*nūn'shi-ō*), diplomatic representative of the Pope.
 Nuncupative will W-98
 Núñez Cabeza de Vaca. *See in Index* Cabeza de Vaca
 Nun's Priest's Tale, in 'Canterbury Tales' C-161
 Nun's veiling, a fine worsted fabric originally made in black and used for nuns' veils.
 Nureddin (*nūr-ēd-dēn*), Mah'mud (1116-74), sultan of Syria and Egypt
 Saladin and S-12
 Nuremberg (*nū'rēm-bērg*), Germany, also Nürnberg, manufacturing city of n. Bavaria; pop. 410,000: N-185-6, *map* G-66
 engraving by Dürer, *picture* E-293
 museum, *table* M-392
 watches W-39
 'Nuremberg Chronicle' T-174
 Nurse Corps, U. S. Army A-307a
 insignia U-178
 Nursery schools K-19-21
 Nursing N-186
 baby care B-1-4
 Clara Barton B-52
 first aid F-62-66
 Florence Nightingale N-145
 home nursing H-327
 pioneer women P-221e
 Red Cross R-59-62, N-12m
 vocation V-322
 Nut (*nūt*), Egyptian goddess (the sky), mother of Osiris.
 Nutat'ion, of the earth E-135
 Nutcracker, Clark's. *See in Index* Clark's nutcracker
 Nut-gall. *See in Index* Galls
 Nuthatches, a family of small tree-climbing birds N-186-7
 classified B-139
 white-breasted, *color plate* B-140
 Nutley, N. J., town on Passaic River, chiefly residential, 3 mi. s. of Passaic; pop. 21,954; plastic materials.
 Nut margarine, or nut butter O-221-3
 Nutmeg, seed of nutmeg tree, used as spice N-187, *picture* S-251
 Nutmeg melon, or netted melon M-112
 Nutmeg State, popular name for Connecticut C-335
 Nut pine, piñon, or pinyon tree, of s.w. United States P-220, N-96
 Nutria, a fur R-124
 Nutrition (*nū-trish'ōn*), the general process by which living organisms obtain, modify, and use nutrient materials for growth and repair. *See also in Index* Digestion; Food; Hygiene; Vitamins, *also* Outlines
 B-117, H-327-8, P-208
 food requirements F-144-6, H-372-3
 infant feeding B-1-2
 physiology of digestion and nutrition P-202-7
 plant P-207, P-238-44. *See also in Index* Plants, *subhead* food
 vitamins V-310-12, F-146, H-372
 Nuts, hard-shelled fruits N-187-8
 almond A-133, *picture* N-188
 Brazil nut N-187
 buckeye B-257-8
 butternut B-286
 chestnut C-184-5, *pictures* C-185, N-188
 chinquapin C-222
 coconut C-292-4, *pictures* C-292, 293, N-188
 hazel and filbert H-253
 hickory H-289-91
 industrial uses N-187-8
 peanut P-94-5
 pecan P-99-100
 piñon P-220
 walnut W-5-6, *pictures* W-6, N-188
 weevils attack W-65
 Nuttall, Thomas (1786-1859), English botanist and ornithologist,

among first to make wide survey of American plants and birds; made trip up Missouri River (1809-11); explored along Arkansas and Red rivers (1818-20); accompanied Wyeth expedition (1834-35) to mouth of Columbia.
Nux vomica (*nüks vöm'i-kä*), tree of the logania family; seeds yield the drugs nux vomica and strychnine: S-308, *picture* P-275
 poisoning, treatment P-275, F-64
NYA (National Youth Administration) R-146g
 vocational education V-315
Nyanza (*nyän'zä*), in Central Africa native word for lake V-297
Nyasa (*nyä'sä*), Lake, large lake on e. boundary of Nyasaland protectorate; 14,000 sq. mi.; surrounded

by mountains; discovered 1859 by David Livingstone: A-38, *map* E-139
Nyasaland, East Africa, British protectorate; 37,600 sq. mi. (exclusive of 10,350 sq. mi. of inland waters); pop. 1,600,000: E-139-40, *maps* A-42a, E-139
 trade route to the sea M-294
Nyctaginaceae (*nik-tä-gi-nä'sē-ē*). See in *Index* Four-o'clock family
Nye (*ni*), Edgar Wilson (Bill Nye) (1850-96), American humorist, born Shirley, Me. ('History of the United States'; 'Remarks').
Nye, Gerald P. (born 1892), politician, born Hortonville, Wis.; manager and editor of various newspapers in Wisconsin, Iowa, and North Dakota; settled at Coopertown, N. D., 1919; U.S. senator from

North Dakota after 1925; upheld "isolationist" policy against involvement in 2d World War.
Nylon (*nīlōn*), a protein-like chemical product made from coal, air, and water; durable, elastic; made into hosiery, fibers, bristles, sheets: P-245f, 246
Nymph, in mythology N-188
Nymph, of insects I-86
 cicada C-235
Nymphaeaceae (*nīm-fē-ä'sē-ē*) W-48. See also in *Index* Water-lily family
Nystad (*nü'städ*), Peace of (1721), between Russia and Sweden, signed at Nystad, small port on Gulf of Bothnia: P-143, S-340
Nyx (*nüks*), in Greek mythology, goddess of night, corresponding to Roman Nox.



OUR LETTER O probably started in Egyptian writing as a picture (1) which meant 'eye'. Soon after 2000 B.C., a Semitic people called the Seirites adopted it as an alphabetic sign for a peculiar sound, a sort of deep growl, which came first in their word *ayin* or *ain* for 'eye'.

The Seiritic sign, like the Egyptian, was a crude picture of an eye (2). The later Canaanite-Phoenician alphabet simplified it to a circle (3). Its name, in all Semitic languages, resembled the Hebrew name *ayin*.

When the Greeks learned to write from the Phoenicians, they had no growled *ayin* sound in their speech, and they had no use for the sign with its Phoenician meaning. They did want signs, however, for several vowels which Semitic people never indicated in their writing. The Greeks therefore used the *ayin* sign for the vowel *o*. They called the sign *omicron* (4).

Later they used this sign only for the shorter 'o' sound as in 'obey', and cut off the bottom to make *omega* (5) for the longer 'o' sound as in 'oats'. Since *omega* was a new sign, they put it at the end of their alphabet. Hence we often say 'from alpha to omega', meaning 'from beginning to end', since *alpha* was the first letter of the Greek alphabet.

The Romans, however, were content with only one 'o' in their Latin alphabet, and they chose the simpler *omicron*. From Latin the sign came without change into English. The capital and the small letter, in both printing and handwriting, are distinguished only by size, except that handwritten ones are often connected with their neighbors (6).

NOTE.—For the story of how alphabetic writing began and developed, see the articles Alphabet; Writing.

Oahu (*ō-ä'hü*), one of Hawaiian Islands; 598 sq. mi.; pop. 259,664: H-240-1, *maps* H-242, 243
Oak, a hardwood tree O-189-90, *pictures* T-132, 134, 135
 acorns O-189, *picture* O-190
 galls O-190: dye from D-121; ink from I-79
 leaf L-89, *picture* T-135
 sacred: a n c i e n t beliefs B-174; Druids C-124
 tanning, bark used in L-84
 timber cut, annual amount in U.S. U-194
 wood: gumwood imitation G-188; in wood-carving W-136
Oak, cork C-365-6
Oak, poison P-272
 poisoning, treatment F-66
Oak, "shin," or dwarf "chinquapin" C-222, O-189
Oak apple, an oak gall or gall-nut. See in *Index* Galls
Oakland, Calif., residential and industrial city on San Francisco Bay opposite San Francisco; pop. 302,163: O-190-1, *map* C-28
 bridge to San Francisco B-240b, *picture* B-240a, *table* B-342

Oak Leaf Cluster, U. S. Army decoration of honor D-31
Oakley, Annie (1860-1926), American markswoman, born in Darke County, Ohio; showed fine marksmanship in early youth; performed in vaudeville and circus troupes; in 1885 joined Buffalo Bill's Wild West Show; toured in United States and Europe.
Oakley, Violet (born 1874), American painter, born New York City; studied in U. S. and Paris; works are colorful and decorative and have fine illustrative quality; did murals for the state capitol at Harrisburg and the county court house at Cleveland.
Oak Park, Ill., residential suburb w. of Chicago, formerly part of town of Cicero; pop. 66,015; incorporated as village 1902.
Oakum, hemp fiber obtained by untwisting strands of old tarred rope; used in calking seams between wooden planks.
Oar-fish, a large, deep-sea fish with two oarlike fins F-72
Oasis (*ō-ä-sīs* or *ō-ä'sīs*), fertile spot

in a desert, *pictures* E-201, A-37, A-125
Asia A-328: Persia P-130
Libyan desert E-195, L-121a
Sahara A-34, S-4
Oastler, Richard (1789-1861), English reformer; called "The Factory King" because of energetic advocacy of the factory-workers' cause.
Oates, Lawrence Edward Grace (1880-1912), English army officer and polar explorer with Scott S-48
Oates, Titus (1649-1705), English conspirator, who falsely accused the Catholics of a "popish plot" (1678-80) to restore Catholicism.
Oath, or pledge
 Boy Scouts B-214
 Camp Fire Girls C-41
 fealty F-28
 Four-H club F-164
 Girl Scouts G-95
 naturalization, U. S. N-27
 president of U.S. P-344
Oatmeal, a breakfast cereal. See in *Index* Oats, *subhead* rolled
Oatmeal biscuits B-229
Oats O-191
 pests O-191, C-222

- producing regions O-191
rolled B-234: irradiation of, *picture*
R-15
rusts and smuts R-199-201
starch content S-276
- Oaxaca (*wā-hā'kū*), Mexico, state in
s., on Pacific; 36,371 sq. mi.; pop.
1,150,000: cap. Oaxaca (de Juarez):
map M-133
- Oaxaca (de Juarez), Mexico, commer-
cial and industrial center in beauti-
ful Oaxaca valley, 225 mi. s.e. of
Mexico City; cap. of Oaxaca state;
pop. 31,000; formerly Huaxyacac,
military post of Aztecs: M-132b,
142, 142d, *map* M-133
- Obadiah (*ō-bā-dī'ā*) (6th century
B.C.), Hebrew minor prophet, au-
thor of the 31st book of the Old
Testament, which bears his name.
Book denounces Edomites.
- Obbligato, in music, an accompani-
ment which is essential to the com-
position; usually written for a
single instrument which supple-
ments the leading part taken by
another instrument or voice.
- O'bed, in Old Testament, son of Ruth
and Boaz R-202
- Obedience, in character education,
Outline C-143
- 'Obedience', a Little Talk by Arthur
Mee O-192
- Obelisk, a four-sided tapering shaft
with a pyramid top; a favorite form
of monument of the ancient Egyp-
tians
Cleopatra's Needle A-116, *picture*
N-126
Queen Hatshepsut E-209
Rome, *picture* P-55
Thutmose III, *picture* T-162
- Oberammergau (*ō-bēr-ām'ēr-gou*), vil-
lage in Bavaria, Germany, 43 mi.
s.w. of Munich; famous for Passion
Play, given as thank-offering for
deliverance from plague in 1633:
B-65
- Oberhausen (*ō'bēr-hou-zēn*), Ger-
many, manufacturing town in
Rhine Province, Prussia, 35 mi. n.
of Cologne; pop. 186,000; iron and
chemical works.
- Ob'erhoffer, Emil (1867-1933), Amer-
ican musical conductor, born Ger-
many; organized Minneapolis Sym-
phony Orchestra, which he con-
ducted 1903-22.
- Oberkampf, Christophe-Philippe (1738-
1815), textile printer, born Ba-
varia; learned how to print cloth
from carved rolls; 1768 started
plant at Jouy, near Paris; plant
destroyed in revolution of 1815:
T-66, *picture* T-68
- Oberlin (*ō-bēr-lān*), Jean Frédéric
(1740-1826), Alsatian Lutheran
clergyman; for 60 years was pastor
at Ban-de-la-Roche; aided in gen-
eral well-being of people, improv-
ing agriculture and education,
building roads; Oberlin, Ohio,
named for him.
- O'berlin, Ohio, town 33 mi. s.w. of
Cleveland; pop. 4305; Oberlin Col-
lege.
- Oberlin College, at Oberlin, Ohio; non-
sectarian; founded 1833; first co-
educational college in U. S.; arts
and science, music, theology
aluminum solvent discovered at
H-201
- Oberon (*ō'bēr-ōn*), in English folk-
lore, king of the fairies; Titania is
his queen
'Midsummer Night's Dream' M-162
- Oberrealschule (*ō'bēr-rā-äl-shō-lū*),
German school G-70
- Obi (*ō'bi*), a broad belt worn with
a kimono in Japan.
- Objec'tive, in optics, the lens in an
optical system nearest the object
viewed
magnifying action L-97
microscope type M-156-7
telescope type T-38, 39
- Objective case, in grammar N-179
- Objective color L-130
- Oblique parallelepiped G-49
- Oblique triangles T-140
- Oboe (*ō'bō*), or hautboy, a wood-wind
musical instrument W-135, M-323
- Obolus (*ō'bō-lūs*), a modern Greek
unit of weight, equal to 1.54 grains
or 0.1 gram (metric); in ancient
times, equal to 11.0 grains or 0.71
gram.
- Obregón (*ō-brā-gōn*), Alvaro (1880-
1928), Mexican general and presi-
dent of Mexico M-142f
- Obrenovitch (*ō-brēn'ō-rīch*), ruling
Serbian family; held power (not
continuously) from accession of
Milosh Obrenovitch to assassination
of Alexander (1903): S-81
- Obrenovitch, Milosh, or Milosh (1780-
1860), prince of Serbia, born a
peasant; for services in freeing
Serbia from Turkish rule called
"father of his country": S-81
- O'Brien, Forest, American aviator,
table A-74
- O'Brien, Frederick (1869-1932),
American writer, born Baltimore,
Md.; went to sea at 18 and after-
ward traveled widely ('White
Shadows in the South Seas'; 'Mys-
tic Isles of the South Seas').
- O'Brien, Jeremiah (1744-1818), Amer-
ican naval officer, born Kittery,
Me.; with five brothers and other
volunteers captured two British
ships off Matthias, Me. (1775);
later commanded first two ships of
Massachusetts navy.
- Ob (*ōb*) River, great navigable river
of w. Siberia; flows n.w. and n.
2500 mi. to Gulf of Ob, bay of
Arctic Ocean; chief tributary, the
Irish: A-330, *map* A-332b
- Observation balloon B-22-3, 24, *pic-
tures* B-25, 27
- Observation plane A-307, A-70
- Observatory O-193-4, *pictures* O-193,
194, A-347, T-39, 40
telescopes T-38-40. *See also in In-
dex* Telescope
time fixed by T-94-96
- Obsid'ian, a glass-like lava used as an
ornamental stone L-73, G-28, M-185
- Obtuse angle G-47
- Ocantos (*ō-kān'tōs*), Carlos Mari'a
(born 1860), Argentine novelist
L-67t
- 'O Captain! My Captain!' poem by
Walt Whitman W-95
- Ocarina (*ōk'ā-rē-nā*), a musical in-
strument M-323
- O'Casey, Sean (born 1890), Irish play-
wright; born in the slums of Dub-
lin; a laborer, self-taught, he won
wide praise for the theatrical skill
of his plays, keen humor, and mer-
ciless realism ('Juno and the Pay-
cock'; 'The Plough and the Stars';
'The Silver Tassie').
- O'cam, or Ockham, William of (died
1349), English philosopher and
logician; opposed temporal power
of papacy; highly important con-
tributions to logic and metaphysics.
- Occiden'tal College, at Los Angeles,
Calif.; founded 1887 by Presbyteri-
ans but now non-sectarian; liberal
arts.
- Occipital bone, of the cranium S-156,
picture S-156
- Occulta'tion, in astronomy E-144
- Occupational diseases
phosphorus poisoning P-177
- Occupations. *See in Index* Vocational
education; Vocational guidance
Canada, *photograph* C-50a
United States, *photograph* U-188d:
industries, *graph* U-193
- Ocean O-195-201. *See also in Index*
Navigation; and the principal
topics below by name. For list of
oceans and seas of the world *see*
table on next page
- Antarctic O-196
- Arctic A-277, O-196
- Atlantic A-358-60
books about: seashore H-313f-g
cables C-4-9
circulation of waters O-200-1
climate affected by W-42-3, C-270a:
currents O-200-1; Europe E-316,
N-172
color O-201
continental shelf P-198, N-153
corals C-362-4
currents. *See in Index* Ocean cur-
rents
deep-sea life. *See in Index* Ocean,
subhead plant and animal life
depths O-196, *diagram* O-196, *picture*
A-63: Atlantic A-358, *map* A-359;
how measured N-49, O-201; Indian
Ocean I-51; Pacific P-1
divers and diving D-72-3, O-196,
E-345, *color plates* O-200a-d
evaporation O-201
floods F-106d
floor P-202: Atlantic A-358
fogs F-132
fossils F-162, *picture* G-44
hydrographic surveying S-332
icebergs I-4
Indian I-51
lands covered by, in the past O-195
largest O-195
level: geologic changes G-42, I-3;
variations O-201
lighthouses and lightships L-131-4
microscopic forms of life O-200
mirages M-199, *picture* M-198
mountains M-292: Atlantic A-358
origin P-198, W-42
Pacific P-1-11
phosphorescence P-176
plant and animal life O-198-200,
B-114, *pictures* O-197, 199, *color*
plates F-72a-b, O-200a-d: sea-
weed S-72; specimens, how se-
cured O-198, *picture* O-195
proportion of earth's surface O-196
sounding devices N-49, O-201
storms S-298
sunlight in depths O-198
temperature O-201
tides T-90-2
water
circulation O-200-1
compressibility W-45
fresh, at Amazon outlet A-139
minerals in O-196
pressure O-196, 198, W-45
salt content O-196, W-45: a basis
for calculating earth's age E-130;
origin O-201
weight of W-45
waterspouts W-52-3
waves W-57-8
winds W-112-13
- Ocean climate, or marine climate
C-270a, E-316, O-200-1
- Ocean currents O-200-1
Antarctic: Ecuador affected E-154;
Peru affected P-137
Gulf Stream G-185
Japan O-200, J-186d: effect on
Alaska A-102
Labrador A-359, L-46: fogs F-132
- Ocean Grove, N.J., town on Atlantic
6 mi. s. of Long Branch; summer
pop. 20,000 to 30,000; controlled by
Ocean Grove Camp Meeting Asso-
ciation of Methodist church: N-90,
map N-90
- Ocean'ia, or Oceanica, islands of Pa-
cific Ocean divided into Polynesia,
Micronesia, and Melanesia: P-3-11,

ü=French u, German ü; jem, jo; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); x=German guttural ch

THE OCEANS AND SEAS OF THE WORLD

NAME	AREA IN SQ. MI.	MEAN DEPTH IN FEET	VOLUME IN CU. MI.
I. OCEANS			
Pacific Ocean	63,801,600	14,052	169,749,500
Atlantic Ocean	31,830,700	12,874	77,609,600
Indian Ocean	28,356,200	13,002	69,821,000
Arctic Ocean	5,440,200	3,954	4,073,700
<i>Total Oceans</i>	<i>129,428,700</i>		<i>321,253,800</i>
II. SEAS, BAYS, AND GULFS			
Malay Seas	2,248,600	3,401	1,448,600
Barents Sea	942,600	512	91,200
South China Sea	895,400	5,419	920,000
Bering Sea	878,000	4,716	784,100
Mediterranean Sea	843,500	5,383	859,800
Caribbean Sea	756,000	8,669	1,241,500
Gulf of Mexico	618,200	4,874	570,700
Sea of Okhotsk	589,800	2,748	306,800
East China Sea	482,300	618	56,400
Hudson Bay	475,800	420	37,900
Sea of Japan	389,100	4,428	326,500
Andaman Sea	308,000	2,856	166,500
Yucatan Channel and Gulf of Honduras	293,600	8,708	484,400
North Sea	190,000	312	11,200
Red Sea	169,100	1,500	48,000
Caspian Sea	168,500	591	19,000
Baltic Sea (including Kattegat)	163,000	180	5,500
Black Sea	162,100	4,018	123,400
Persian Gulf	92,200	200	3,500
Gulf of St. Lawrence	91,800	420	7,200
Aegean Sea	69,100	1,912	25,100
Gulf of California	62,600	2,670	31,700
Adriatic Sea	51,000	794	7,700
Irish Sea	39,900	197	1,500
English Channel	29,000	177	900
Lake Aral	25,100	52	200
Sea of Azov	16,200	33	100
Sea of Marmara	3,200	1,027	600
<i>Total Seas, Bays, and Gulfs</i>	<i>11,053,700</i>		<i>7,580,000</i>
TOTAL FOR THE WORLD	140,482,400		328,833,800

NOTE. The figures for each body of water exclude those of adjoining waters if the latter are named in the table. For example, the figures for the Mediterranean Sea do not include the Adriatic Sea or the Aegean Sea; but they do include the so-called Ionian Sea and Tyrrhenian Sea which are not listed here. For the waters included in Malay Seas, see in *Index* Malay Seas.

map P-10b-c. See also in *Index* chief islands and groups by name minerals, production and trade, *pictographs* M-188b, 189

Oceanides (ō-sē-ān'i-dēz), in Greek mythology, ocean nymphs N-188

Ocean Island, tiny British island possession in Pacific Ocean, s. of Equator, between Gilbert Islands and Nauru; seat of government of Gilbert and Ellice Islands Colony; phosphate deposits; area 2 sq. mi.; pop. about 3000: map P-10b

Ocean liners C-323, S-120-30 model by Norman Bel Geddes, *picture* A-81

Oceanographic Museum, Monaco, *picture* M-247, table M-393

Oceanography, the science of ocean phenomena P-197

Ocean Springs, Miss., resort on Bay of Biloxi, inlet of Gulf of Mexico, 5 mi. e. of Biloxi; pop. 1881.

Oceanus (ō-sē-ā-nūs), in Greek mythology, eldest of the Titans, personification of the all-encircling ocean; father of the Oceanides.

Ocelli (ō-sēl'i), "simple" eyes of insects I-87

Ocelot (ō'sē-lōt), a leopard-like cat L-98a

cat family characteristics C-95-6

Ocher (ō'kēr), or ochre, a natural earth or clay found in all parts of the world; color varies from pale to dark yellow, depending upon the amount of coloring matter, hydrated oxide of iron, the clay contains; used as pigment in paint.

Ochs, Adolph Simon (1858-1935),

American newspaper publisher; born Cincinnati, Ohio, of Jewish parents; rose from newsboy and printer's devil to ownership at 20 of the *Chattanooga Times*; acquired control of New York *Times*, 1896; brought both papers from financial difficulties to great prosperity; his policy was to print sound news only, no sensational features: T-86

Oechtman (ōkt'mān), Leonard (1854-1934), American painter, born Holland; practically self-taught; landscapes noted for atmospheric luminosity and a delicate lyrical quality ('Night on the Mianus River'; 'An Autumn Moonlight'; 'The Enchanted Vale').

Ockenheim (ōk'ēn-him), Joannes. See in *Index* Okeghem

Oekham, William of. See in *Index* Occam, William of

Oemulgee National Monument, in Georgia N-22c

Oemulgee (ōk-mūl'jē) River, rising in n. cent. Georgia; flows 260 mi. s.e., joining Oconee to form Altamaha dam at Macon G-56

O'Connell, Daniel (1775-1847), Irish lawyer and political leader O-201

O'Connell, William Henry, Cardinal (born 1859), American Roman Catholic prelate, born Lowell, Mass.; archbishop of Boston after 1907, cardinal after 1911.

O'Connor, Andrew (1874-1941), American sculptor, born Worcester, Mass.; statues and bas-reliefs in marble and bronze (porch of St.

Bartholomew's Church, New York City; statue of Abraham Lincoln at Springfield, Ill.).

O'Connor, Thomas Power ("Tay Pay") (1848-1929), Irish politician and journalist, active in the cause of Irish nationalism; called "father of the House of Commons," of which he was a member for 49 years; founded and edited *T. P.'s Weekly*.

Ocotillo (ōk-ō-tī'lō), a shrub (*Fouquieria splendens*) having numerous slender, spiny branches, scale-like leaves, and clusters of flame-red flowers; common in desert areas of s.w. U. S. and Mexico; also called coach-whip cactus, Jacob's staff, or candle flower: *picture* P-235

Octane, in chemistry, a hydrocarbon (C₈H₁₈). See also in *Index* Paraffin series

anti-knock test for gasoline P-150

Octave (ōk'tāv), in music, the 8th full tone above or below any given note; also the interval between a note and its octave: S-198

Octave, in radiation R-14

Octavia (ōk-tā'vī-ā) (died 11 B.C.), sister of the Roman emperor Augustus, and faithful wife of Mark Antony; deserted by him for Cleopatra: C-264

Octavia (42-62 A.D.), Roman empress, wife of Nero; divorced by him in favor of Poppaea Sabina; banished to island of Pandataria on false charge of unfaithfulness and there murdered.

Octavian, Octavianus, or Octavius, Gaius Julius Caesar. See in *Index* Augustus

Octavo, a book size B-181

Octet theory, of atomic structure A-361

October O-201

birthdays of famous persons. See in *Index* Anniversaries and birthdays, table

birth stone G-25

holidays H-321; foreign H-323

Octometer, line in poetry P-269

Octopus, or devil-fish C-417, M-218, *pictures* C-417, P-96

egg E-192

reactions when attacked E-262

Oculist (ōk'ū-līst), or ophthalmologist, a physician who restricts his practise to the eye and its diseases S-240

Odalisk T-163

Odd Fellows, Independent Order of, an international, secret, fraternal, beneficiary society founded in England about 1745. Thomas Widely, who organized a lodge in Baltimore in 1819, is considered the founder of the American order. The Rebekah degree for women was established in 1851. The distinctive feature of the order is its care for sick, distressed, and dependent members and their families.

Ode (ōd), a form of stately and elaborate lyric poetry; originally a poem intended to be chanted or sung: P-271

Dryden D-115

Horace L-69

Keats K-9

Pindar G-172

Odell, William Franklin (1774-1844), Canadian statesman, born Burlington, N.J.; provincial secretary of New Brunswick 1812-44, succeeding his father, Jonathan Odell, who held the office 1784-1812.

Odena thus (died 271 or 266 A.D.), general and ruler of Palmyra P-40

Odense (ō'dēn-sē), 3d city in Denmark, on island of Fünen at mouth

- of Odense River; pop. 75,000; splendid cathedral; industrial and commercial center: map D-53
origin of name D-52
'Ode on a Grecian Urn', poem by Keats K-9
- Oder** (*ô'dêr*), important river of Germany; rises in Moravia, flows n.w. 560 mi. and enters Baltic by 3 arms after widening to form Stettiner Haff; commercial cities on river include Breslau, Frankfort-on-the-Oder, and Stettin: map G-66
commerce G-65
- Odes'sa**, Russia, seaport of the Ukrainian Soviet Socialist Republic on Black Sea; pop. 605,000: O-202, maps B-154, E-326e
- Odessus**, ancient name of Varna, chief port of Bulgaria, on Black Sea; pop. 70,000; cotton mills; exports cattle, grain.
- Odets, Clifford** (born 1906), American playwright, born Philadelphia, Pa.; interprets Jewish family life, with rich dialogue, in 'Awake and Sing' and 'Paradise Lost'. His 'Waiting for Lefty' is about taxi-drivers' strike; 'Golden Boy', a saga of violinist turned prize-fighter.
- Odin** (*ô'dîn*), also Woden, or Wotan, in Norse mythology, father of the gods: O-202, picture O-203
in 'Nibelungenlied' N-140
Odense named for D-52
- O'do**, French Eudes (*âd*) (died 898 A.D.), king of the Franks, crowned 888 after deposition of Charles the Fat; son of Robert the Strong; fought Normans and his rival Charles III for French throne
defense of Paris N-168
- Odoozer** (*ô-dô-â'sêr*) (434?-493), German leader who seized power in Italy, deposed Romulus Augustulus, and thus overthrew the Western Roman Empire in 476: G-123
- Odometer**, for measuring distance traveled, diagram S-244
- Odonata** (*ô-dô-nâ'tâ*), an order of membranous winged insects consisting of the dragon-flies and the damselflies.
- O'Donnell, Peadar** (born 1896?), Irish novelist; writes sympathetically and discerningly of Irish peasants; suffered period of imprisonment for revolutionary activities ('Storm'; 'The Way It Was with Them'; 'There Will Be Fighting').
- Odontoid process** S-156
- Odontolite** (*ô-dôn'tô-lî*), a variety of fossil bone or tooth colored blue by iron phosphate, sometimes called fossil or bone turquoise; used as gem stone.
- Odor**, a scent S-184
- Odysseus** (*ô-dis'ûs*), in Greek mythology, king of Ithaca and Trojan War hero O-204-8
Achilles called to war A-8
Aeolus aids A-27-8
Ajax contends with A-95
Circe C-237
Cyclops C-419
Greek life in time of G-156
Homer's 'Odyssey' H-329-30
Wooden Horse T-143-4
- '**Odyssey**' (*ôd'i-si*), Greek epic poem relating adventures of Odysseus on return from Trojan War H-329-30.
See also in Index Homer
influence on Latin literature L-68
place in Greek literature G-171
- Oedipus** (*êd'i-pûs*), in Greek mythology, king of Thebes, whose tragic fate formed subject of many dramas: O-208, picture G-171
answers riddle of Sphinx R-107
- '**Oedipus**', musical composition by Paine M-316
- Oehlenschläger, Adam**. See in Index Ohlenschläger
- Oenone** (*ê-nô'ni*), in Greek mythology, river-nymph, wife of Paris; story told in Tennyson's 'Oenone'
Paris deserts P-70
- Oenothera** (*ê-nô-thâ'râ*). See in Index Evening primrose
- Oerlikon gun**, picture M-9
- Oersted** (*ôr'stêd*), or Orsted, Hans Christian (1777-1851), Danish physicist; established connection between electricity and magnetism: E-227, 232, picture E-231
- OES** (Office of Economic Stabilization) N-12q
- Oesophagus, esophagus** (*ê-sôf'â-gûs*), or gullet, muscular tube from mouth to stomach P-206, S-292
- Oesterreich**. See in Index Österreich
- '**Oesterreichische Bundeshymne**' (*û'stêr-rik-i-shê bûn'dês-hûm-nê*), Austrian national hymn N-25
- Of'ra** (died 796), king of Mercia; defeated Wessex and the Welsh, wresting part of land from latter and building great fortifications ('Offa's Dyke') along whole border between England and Wales.
- Offenbach** (*ôf'ên-bâk*), Jacques (1819-80), composer of French operettas, born Cologne, Germany, of Jewish parents; his works made *opéra bouffe* popular in French theaters
story of 'Tales of Hoffmann' O-233
- Office**, as applied to units or parts of the United States government. See office by name, as Civilian Defense, Office of
- Officers of U.S. Army A-307d-e**
insignia U-180, pictures U-178
Military Academy M-170-2
- Officers of U. S. Coast Guard C-289**
- Officers of U.S. Navy N-56b-d**
insignia U-180-1, pictures U-179
Naval Academy N-44-5
- Offset process**, in lithography L-164, E-298
- O'Flaherty, Liam** (born 1897), Irish writer; studied for priesthood in youth; novels and short stories are vivid and realistic, reflecting the author's adventurous life and also Irish life during the Irish Rebellion ('Famine'; 'The Informer').
- Ogasawara** (*ô-gâ-sâ-wâ'râ*) Jima, or Bonin Islands, group of Japanese islands in the Pacific 530 mi. s.e. of Yokohama; 30 sq. mi.: map P-10b
- Ogburn, William Fielding** (born 1886), sociologist and educator, born Butler, Ga.; professor of sociology, University of Chicago after 1927; member of many federal boards for social and economic planning ('American Marriage and Family Relationships'; 'You and Machines'; 'Social Characteristics of Cities').
- Ogdai Khan** (died 1241), Mongol emperor M-223
- Ogden, Peter Skene** (1794-1854), British-American fur trader; cultured, resourceful, widely known and respected among Indians; during 33 years' service with Hudson's Bay Company in northwest explored much territory and became head of Columbia River district; Ogden, Utah, named for him.
- Ogden, Utah**, manufacturing city in agricultural region, 34 mi. n. of Salt Lake City on Weber and Ogden rivers; pop. 43,688: U-266, map U-264
- Ogdensburg, N.Y.**, port on St. Lawrence River, at foot of deep-water navigation of Great Lakes; pop. 16,346; trade in grain and coal; newsprint paper, window-shade rollers, brass goods: map N-114
- Ogeechee** (*ô-gê'chê*) River, in Georgia, 250 mi. to Ossabaw Sound, map G-56
- Ogier** (*ô'gi-êr*), the Dane, hero of romance, figuring in literature of several countries; was hostage for his father Godfrey, Duke of Denmark, at court of Charlemagne.
- Oglala** (*ô-glâ'lâ*), a tribe of the Teton Sioux Indians living chiefly in South Dakota; some in North Dakota.
- Oglethorpe** (*ô-gl-thôrp*), James Edward (1696-1785), English general and philanthropist, founder of Georgia G-58, picture A-151
prohibits importation of liquor into Georgia P-350
Savannah S-32
- Oglethorpe Day** (February 12) H-320
- Oglethorpe National Trail and Parkway N-22f**
- OGPU**, or Gay-Pay-Oo, the secret police of the Soviet Union until 1934. Name made from initials of words meaning Special Government Political Administration. Work now carried on by the Commissariat for Internal Affairs: R-192
- Ogygia** (*ô-gîg'i-â*), in Greek mythology, the island of Calypso O-205
- O'Hara, John Henry** (born 1905), writer, born Pottsville, Pa.; style simple and direct; contributor to *New Yorker* and other magazines ('Appointment in Samarra').
- O'Hare, Edward H.** (born 1914), naval aviator, born St. Louis, Mo.; in naval engagement w. of Gilbert Islands Feb. 20, 1942, he shot down five Japanese bombers; awarded Congressional Medal of Honor; reported "missing in action" off Marshall Islands Nov. 1943.
- O. Henry**, pen name of William Sydney Porter (1862-1910), American short-story writer P-305-6
- O'Higgins, Bernardo** (1778-1842), Chilean patriot and dictator, leader in war for independence C-208
flag, Chile F-94
- O'Higgins, Harvey** (1876-1929), American writer, born London, Ontario; won first fame with stories of Irish in New York ('Some Distinguished Americans').
- Oh'io**, a n. cent. state of U. S.; 41,222 sq. mi.; pop. 6,907,612; capital Columbus: O-209-14, maps O-210, U-188c
agriculture O-212-13
Arbor Day, school festival A-247
bird, state B-122
cities O-212, list O-209. See also in Index names of cities
commerce O-214
education O-214: Cincinnati C-236; Cleveland C-269; Columbus C-319; Dayton D-22; Toledo T-105
famous citizens O-209, 214: of Cleveland C-269
flag F-92, color plate F-87
flood control E-145e
flower, state S-279
forests, national and state, table F-250
glacial history O-213
glass G-106
history O-214
geographical position important O-209-10
settlement O-209-10
Clark's expedition C-259
Western Reserve C-341
Northwest Territory N-171
first university land grant E-181
development of Cincinnati C-236
Cleveland settled C-269
Johnny Appleseed A-232
discovery of natural gas G-23
boundary dispute with Michigan O-214
manufactures O-212, list O-209: Akron A-95; Cincinnati C-236;

Cleveland C-268; Dayton D-22; Toledo T-105; Youngstown Y-208-9
minerals O-210-12
mound builders in M-291
name, origin of, and nickname S-279
national monuments N-22b, c
natural features O-213-14
products, *chart* and list O-209
transportation O-210, 212, C-268:
Ohio River O-214, 215
Ohio and Erie Canal, between Ports-
mouth and Cleveland, Ohio O-210
Ohio Company of Associates, company
formed by New England colonists
(1786) for purchase and settlement
of western lands; large tracts in s.
Ohio purchased from Congress
Marietta founded (1788) O-214
Ohio River O-214-15, *maps* O-210,
K-11
bridge, Metropolis, Ill., *picture* B-242
commerce: of Ohio O-210, 212, 214;
of Pennsylvania P-114, P-224-5
early navigation L-209, I-47
floods F-106a
influence on settlement P-221c, I-46,
U-183
Ohio State University, at Columbus,
Ohio; state institution; founded
1870; colleges of agriculture, arts
and sciences, commerce and admin-
istration, education, engineering,
law, dentistry, medicine, pharmacy,
veterinary medicine, journalism;
graduate school: C-319, *picture*
O-212
Ohio University, at Athens, Ohio;
state institution; opened 1808
(chartered 1804); colleges of lib-
eral arts and education; schools of
music and commerce; special de-
partments in engineering, home
economics, physical education, art,
dramatic art.
Ohio Wesleyan University, at Dela-
ware, Ohio; Methodist; opened
1844 (chartered 1842); liberal arts,
music and fine arts; Perkins Astro-
nomical Observatory.
Ohlenschläger, or Oehlenschläger
(*ô-lîn-shlâ'jër*), Adam Gottlob
(1779-1850), Danish poet and
dramatist of wide influence; a pio-
neer of romantic movement in Eu-
rope; fluent, profuse style ('Hakon
Jarl'; 'Aladdin's Lampe'; 'Palna-
toke'; 'Guldhornene').
Ohm (*ôm*), Georg Simon (1787-
1854), German mathematician and
physicist; "ohm," unit of electrical
resistance, named for him; also
"Ohm's law."
Ohm, unit of electrical resistance
E-222
Ohm's law, for measuring electric cur-
rent E-222, 223, *diagrams* E-223, 224
Cavendish anticipates discovery
E-232
modified for alternating current
E-230
Oil beetles, group of blister beetles,
subfamily *Meloidae*, that give off a
disagreeable, oily fluid when dis-
turbed, *picture* B-81
metamorphosis B-84
Oil-burning ships S-124
Oil-cake, seeds from which oil has
been pressed F-19
corn C-368, *chart* C-366b
cottonseed C-376: South Carolina
S-213
soy bean, *picture* M-52
Oil City, Pa., on Allegheny River
about 60 mi. s.e. of Erie, one of
largest oil markets of Pennsylva-
nia petroleum fields; pop. 20,379;
map P-112
Oilcloth
how made L-149: lithopones used
P-32

Oil Conservation Board, Federal P-152
Oil heating H-261, P-150
burner, *picture* H-265: safety cut-off
P-178
Oil industry P-144-5. *See also in*
Index Petroleum
Oiling, of machinery L-211. *See also*
in Index Lubricant
Oil of vitriol S-324. *See also in In-*
dex Sulphuric acid
Oil painting P-15-16. *See also in In-*
dex Painting
Oils F-18-19. *See also in Index* Fats;
Petroleum; and chief oils by name
animal oils F-18-19: haliver oil
H-200; sperm oil W-80
butter substitutes O-221-3, F-19
chemical nature F-18, 19
coal-tar derivatives C-288-9
colloidal mixture in water C-303
corn C-368, 369, F-19, *chart* C-366b
drying oils F-19
essential F-19: in perfumes P-124;
in spices S-250; in wintergreen
W-114
fats distinguished F-19
fuel oils F-215-16
fuller's earth a purifier F-217
hydrogenation H-368
iridescence explained L-129
lighting L-57
lubricants L-211
paints, varnishes P-32-32a, b, F-19
petroleum ("mineral oil") P-144-53
soaps made from S-175, 177
soy bean S-224
vegetable oils F-19: margarine O-221
water and oil, why they do not mix
C-174, *diagram* C-173
waterproof property F-18
Oilstone, smooth, fine-grained rock
used for sharpening tools; so called
because often used with oil.
Oil tanks, for storage, *picture* P-151
protection from lightning L-135
Oil wells. *See in Index* Petroleum,
subhead wells
Oise (*wâz*) River, in n. France; rises
in s.w. Belgium; flows s.w. receiv-
ing Aisne at Compiègne, and joins
Seine 15 mi. n.w. of Paris; length
187 mi.; strategic line in 1st and 2d
World Wars: *map* F-179
Oisin. *See in Index* Ossian
Oiticica (*oy-tî-sê'kâ*) oil P-32a
Ojeda (*ô-hâ'dhâ*), Alonso de (1465?-
1515), Spanish explorer; accom-
panied Columbus on his second
voyage, 1493; founded colony on
Gulf of Darien, 1509.
Ojib'wa, or Chippewa, Indians, large
Algonquian tribe living about upper
Great Lakes in both Canada and
the U. S. and extending w. into
Minnesota and North Dakota
houses I-59
picture writing, *picture* I-63
Oka. *See in Index* Trappist cheese
Okano'gan, Lake, or Okan'agan, in s.
British Columbia, 60 mi. long, *map*
C-50b
Okanogan River, a tributary of the
Columbia in British Columbia and
Washington, rising in Lake Oka-
wogus; 300 mi. long: *map* W-29
Okapi (*ô-kâ'pî*), a giraffe-like animal
of central Africa G-92, *picture* A-33
discovered E-346
Oka (*ô-kû'*) River, in central Russia;
though rapid, is navigable for al-
most entire length of 950 mi.; joins
Volga River at Nijni-Novgorod.
Okeecho'bee Lake, Florida, 40 mi.
long, 25 mi. wide: F-115-16, *maps*
F-111, 112
O'Keeffe, Georgia (Mrs. Alfred Stieg-
litz) (born 1887), American
painter, born Sun Prairie, Wis.;
noted chiefly for her work in ab-
stract design; also for unique fash-
ion in which she paints flowers.

Okefenokee (*ô-kê-fi-nô'kê*) Swamp,
in Georgia and Florida G-55, *map*
G-56, *picture* G-57
Okeghem (*ô'kê-jêm*), Joannes, also
Ockenheim (1434?-96?), Flemish
composer of church music, and a
music teacher of great influence;
his pupils were founders of schools
of music in many parts of Europe.
Okhotsk (*ô-kôtsk'*, Russian *ô-kôtsk'*),
Sea of, large inlet of Pacific in-
denting e. coast of Siberia; area
589,800 sq. mi.; mean depth 2748
ft.: *map* A-332b
fur seals of Robben Island S-69
Okhotsk Current, a cold current which
flows s. from Sea of Okhotsk
dividing into two branches, one
flowing towards Asia, the other
along e. coast of Japan
effect on Japan J-186d
"Okies," popular name for migrant
laborers in the far west, U. S.;
many of them came from Okla-
homa, hence the name.
Oklahoma (*ô-klâ-hô'mâ*), state of s.
cent. U.S.; 69,919 sq. mi.; pop.
2,336,434; cap. Oklahoma City:
O-215-20, *maps* O-216, U-188b-c
agriculture O-218, *picture* O-217
bird, state B-122
cattle ranges C-108, *picture* O-217
cities O-218, list O-215. *See also in*
Index names of cities
cotton picking C-376
education O-218-19, O-221
flag F-92, *color plate* F-87
flower, state S-279
forests, national and state, *table*
P-250
government O-220
Indian Reservations O-219-20
manufactures O-218: glass G-106;
Tulsa T-150
minerals O-218
name, origin of, and nickname S-279
natural features O-216, 218, list
O-215: Ozark Mountains O-266
oil region O-216, 218, P-152
"Oklahoma Run" O-215-16
Platt National Park N-22d
products, *chart* O-216, list O-215
resources: natural gas O-218
'Oklahoma', U. S. Battleship W-178v
Oklahoma, University of, at Norman,
Okla.; state institution; founded
1892; colleges of arts and science,
business, education, fine arts, en-
gineering; schools of medicine, law,
nursing, pharmacy; graduate
school: O-219, *picture* O-217
Oklahoma Agricultural and Mechan-
ical College, at Stillwater, Okla.;
state institution; founded 1891;
schools of agriculture, engineering,
architecture, home economics,
science, literature, education, and
commerce; graduate school.
Oklahoma City, Okla., state capital;
pop. 204,424: O-220-1, *map* O-216
capitol, *picture* O-216
oil wells, *picture* P-144
petroleum refineries, *picture* O-220
Oklahoma College for Women, state
institution at Chickasha, Okla.;
founded 1908; arts and science and
fine arts.
Okmul'gee, Okla., city 40 mi. s. of
Tulsa in rich coal, oil, gas, and
cotton region; pop. 16,051; glass,
oil field tools: *map* O-216
O'kra, or gumbo, an annual flowering
plant of the hibiscus genus; native
of West Indies but extensively cul-
tivated in s. United States
when and how to plant G-13
Okubo (*ô'ky-bô*), Toshimitsu (1830-
78), one of 5 great Japanese nobles
who led revolution (1868) against
shogunate; until death one of the
emperor's chief advisers.

Okuma (*ô'ku-mä*), Shigenobu, Marquis (1838-1922), Japanese statesman, early advocate of abolition of feudal system and advance reforms; founded schools; premier during first half of 1st World War.

Olaf (*ô'läf*) II, Saint (995-1030), king and patron saint of Norway, conquered throne 1016; unified kingdom and continued its christianization

burial place, *picture* N-177
festival day H-323

Olaf I, Tryggvesson (969-1000), king of Norway; began christianization of Norway; leaped into sea after defeat by Danes and Swedes; heroic deeds recounted in Longfellow's 'Saga of King Olaf'.

Öland (*ô'länd*), an island of Sweden, near its s.e. extremity, in the Baltic Sea, separated from the mainland by Kalmar Sound; 519 sq. mi.; pop. 130,000; cap. Borgholm on w. coast.

Olcott, Frances Jenkins, American librarian and writer, born Paris, France (father at that time in U. S. consular service); author and editor of folk-lore and fairy tales for children and books on children's reading ('The Children's Reading'; 'Tales of the Persian Genii').

"Old Abe," the War Eagle, story E-125-6

Old age
economic and social aspects P-304b
leisure, planning L-93d
pensions P-118, S-179; Australia A-373; England L-173; Germany G-73; New Zealand N-135

Old age benefits, stated allowances paid regularly to persons who have reached a certain age; established in United States, England, Australia, New Zealand, and other countries: P-118, S-179

Old Bay State, or Bay State, popular name for Massachusetts.

Oldberg, Arne (born 1874), American composer and teacher of music; born Youngstown, Ohio.

Old Bet, "mother of the American circus" C-237b

'Old Black Joe', song by Stephen C. Foster M-316

Old Castile, Spain, n. part of Castile, an elevated plateau walled in by mountains: *map* S-226

'Old Curiosity Shop', novel by Dickens telling the story of an old curiosity shop keeper and his granddaughter, Little Nell: *picture* D-67b

Old Dominion, popular name for Virginia
origin V-307

Olden Barneveldt. *See in Index* Barneveldt

Oldenburg (*ôld'en-burk*), state (former grand duchy) of n.w. Germany on North Sea; 2480 sq. mi.; pop. 500,000; cap. Oldenburg (pop. 65,000), noted for beautiful gardens and Renaissance castle: P-359

Old English language and literature. *See in Index* Anglo-Saxon language and literature

Old English sheep-dog D-82, *picture* D-77

Old Faithful, geyser in Yellowstone National Park, *picture* G-83

Oldfield pine, a common name sometimes applied to the loblolly pine.

'Old Folks at Home', song by Stephen C. Foster F-164, M-316

Old Forge, Pa., coal-mining borough on Lackawanna River, 4 mi. s.w. of Scranton; pop. 11,892.

"Old Fuss and Feathers," nickname of General Winfield Scott S-51

Old Glory, name given to U. S. flag.
Old Granary Burial Ground, in Boston B-200

Old Guard, popular name of noted body of troops in army of Napoleon I; made last French charge at battle of Waterloo.

Oldham (*ôld'âm*), England, important cotton manufacturing town in Lancashire 6 mi. n.e. of Manchester; pop. 141,000; coal mines: *map* E-270a

"Old Hickory," nickname of Andrew Jackson J-177

"Old Ironsides," nickname of frigate *Constitution*. *See in Index* 'Constitution'

'Old Ironsides', poem by Holmes H-324
quoted N-56c

Old Kasaan, national monument on Prince of Wales Island, Alaska N-22c

'Old Kentucky Home, My', famous American plantation song; words and music written by Stephen Collins Foster in 1850.

"Old King Cole," origin M-272

"Old Lady of Threadneedle Street," Bank of England L-185

Old Line State, popular name for Maryland.

"Old Man Eloquent," nickname of John Quincy Adams A-16

Old Man of the Mountain, head of the Assassins A-338

Old Man of the Sea, in 'Arabian Nights', the little old man who begs Sinbad the Sailor to carry him across a brook and then will not be dislodged from his back; hence, a bore or burden: A-245

Old Manse, in Concord, Mass., home of Emerson and Hawthorne C-328

'Old Mortality', novel by Sir Walter Scott telling of the struggles of Scottish Covenanters with the royal forces under Claverhouse; title taken from nickname of old Robert Paterson who kept the gravestones of the Covenanters in repair
Buchan quoted on S-50

"Old Nanking" porcelain P-330

Old North Church (Christ Church), Boston B-202, *picture* B-201

Old North State, popular name sometimes applied to North Carolina.

Old Point Comfort, Va., summer resort at mouth of James River, 14 mi. n. of Norfolk.

Old Pretender (James Francis Edward Stuart) (1688-1766) P-344

Old Régime (*râ-zhêm'*), name given to the despotic, oppressive government of France before the Revolution (1789).

"Old Reliable," nickname for Sharps buffalo-gun F-50

"Old Rough and Ready," nickname of Zachary Taylor T-20

Olds, Ransom Eli (born 1864), pioneer automobile builder, born Geneva, Ohio; built a 3-wheeled steam carriage 1887, a 4-wheeled steam car 1893, a gasoline car (Oldsmobile) 1896; president of Reo Motor Car Company 1904-24: A-388

Oldsmobile runabout, *picture* A-389

"Old Salamander," nickname of Admiral Farragut F-13

Old Sarum (*sâr'üm*), parish in Wiltshire, England, 2 mi. n. of Salisbury; former city, although almost entirely deserted by 16th century, sent members to Parliament until 1832; proverbial "rotten borough" sends Chatham to Parliament C-156

Old South Church, Boston B-202

Old State House, Boston B-202, *picture* B-201

Old Stone Age. *See in Index* Paleolithic Age

Old Testament, division of the Bible B-102, 104. *See also in Index* Bible divisions P-353

language H-266-7

Prophets P-352-3

"Old Tippecanoe," nickname of William Henry Harrison H-232

Old Trails Road R-112

'Old Wives' Tale', novel by Arnold Bennett, story of two sisters in the pottery-manufacturing section of Staffordshire, England; also title of an old English comedy by George Peele.

Oleaceae (*ô-lê-â'sê-ê*), the olive family, a group of trees and shrubs distributed over temperate and tropical regions; includes ash and olive trees, and lilac, fringe-tree, privet, forsythia, and jasmine.

Olcan (*ô-lê-ân'*), N.Y., distributing point for Pennsylvania petroleum; on Allegheny River 60 mi. s. of Buffalo; pop. 21,506; oil-well machinery, glass, leather, tile: *map* N-114

Olean'er, a flowering shrub O-221

Oleic acid, a fatty acid F-19

Olein (*ô'lê-in*), compound found in fats and oils F-19

Oleomargarine (*ô-lê-ô-mâr'gâ-rên*), butter substitute O-221-3
tallow, or oleo stock in F-19

O'leo oil, in oleomargarine, refined beef fat, *picture* O-221

Oleo stearine F-19

Oléron (*ô-lâ-rôn'*), fertile island off w. coast of France at mouth of Charente River; included in department of Charente-Inférieure; 66 sq. mi.; chief town St. Pierre.

Olfactory nerve, the nerve of smell; branches are distributed to the mucous membrane of the nasal cavity.

Olib'anum. *See in Index* Frankincense

Olier de Verneuil, Jean Jacques (1608-57), French Roman Catholic prelate, born Paris; helped to establish Sulpician settlement at Montreal in 1640.

Oligarchy (*ôl'i-gâr-kî*), a form of government G-126

ancient Greece D-45

Philippine tribes F-10-11

Venice V-279

Oligocene period, in geology G-40, *picture* G-41

Oligoclase, a mineral containing sodium and calcium silicates M-184

Oliphant (*ôl'i-fânt*), Margaret Wilson (1828-97), Scottish novelist and historical writer ('Chronicles of Carrington'; 'Makers of Venice').

Oliphant, or horn, of Roland R-126

Olive, a small fruit-bearing evergreen tree O-223-4

grove in Spain, *picture* S-228

producing regions O-223, 224

sacred tree of Hercules O-224

Olive family. *See in Index* Oleaceae

Olive oil O-223-4, F-19

freezing point, *table* F-194

Oliver, James (1823-1908), American inventor and manufacturer, born Scotland; revolutionized plow making by invention of process for making chilled iron plow: P-259

Oliver Optic. *See in Index* Optic, Oliver

'Oliver Twist', novel by Dickens; relates adventures of orphan who infringes workhouse etiquette by asking for more gruel; runs away and becomes innocent pupil of Fagin the

pickpocket and tool of Bill Sikes the burglar.

Olives, Mount of, historic ridge e. of Jerusalem; favorite resort of Christ and Disciples; contains "Hill of Offense," reputed scene of Solomon's idolatry; alluded to in Old and New Testaments

garden of Gethsemane at foot J-212

Oliv'ia, countess beloved by the duke in Shakespeare's 'Twelfth Night'.

Olivine (*ōl'i-vēn*), also chrysolite, or peridot, a semiprecious stone G-28, M-184

September birthstone G-25

Ollivant, Alfred (1874-1927), English novelist

'Bob, Son of Battle' D-78

Olmedo (*ōl-mā'dō*), José Joaquín de (1780-1847), poet of Ecuador L-67v, picture L-67t

Olmsted (*ōm'stēd*), Frederick Law (1822-1903), pioneer American landscape architect, born Hartford, Conn.; designer of Central Park, New York City, Fairmont Park, Philadelphia, and Franklin Park, Boston; originator of school of landscape gardening which emphasizes natural features, avoiding formal European styles.

Olmütz (*ōl-müts*), also Olomouc (*ōl'ō-mōts*), Germany, town in Moravia on March River 100 mi. n. of Bratislava; coal mining; pop. 67,000; occupied by Swedes in Thirty Years' War; besieged by Frederick II of Prussia (1758); conference to settle Prussian affairs (1850).

Olney, Richard (1835-1917), American jurist and statesman, born Oxford, Mass.; attorney general (1893-95) and secretary of state (1895-97) under Cleveland; used injunction in railroad strike of 1894, first case of court injunction in strike.

Olomouc, Germany. *See in Index* Olmütz

Olszewska (*ōl-shēv'skū*), Maria (born 1892), German contralto; sang in opera and concert in Europe and S. America; American debut, Chicago, 1930.

Olus'tee, Fla., village 46 mi. s.w. of Jacksonville; battle of Olustee or Ocean Pond (Feb. 20, 1864), one of the bloodiest battles of Civil War, resulting in Federal defeat.

Olymp'ia, Greece, plain in ancient Elis on Alpheus River (modern Ruphā); adorned by beautiful temples and statues; scene of Olympic games: O-224

excavations at G-163-4

temple and statue of Zeus S-82, picture S-83

Olympia, Wash., state cap., at head of Puget Sound; pop. 13,254; ships oysters, lumber, fruit; abundant water power; lumber and veneers, canned goods, paper and pulp, shingles: map W-29

capitol, picture W-30

Olymp'iad, formerly the interval of 4 years between celebrations of Olympic Games; in modern usage signifies the Olympic Games: O-224

Olympian gods, the six gods and six goddesses of Greek mythology who were supposed to live on Mount Olympus: Zeus, Apollo, Hermes, Poseidon, Ares, Hephaestus, Hera, Athena, Hestia, Demeter, Aphrodite, and Artemis.

Olympias (died 316 B.C.), fierce, ambitious Epirote princess, wife of Philip II of Macedon and mother of Alexander the Great.

"**Olympic**," a game P-251

Olympic Games, ancient O-224-5

wrestling W-181

Olympic Games, modern A-356

Berlin B-99

Marathon race M-60

Olympic Mountains, in n.w. Washington, part of Coast Range, between Puget Sound and Pacific W-28, picture W-28a

Olympic National Park, in Washington N-22c

Olympic register, Greeks reckoned time by C-23

Olympium (*ō-līm'pī-ūm*), temple of Olympian Zeus at Athens A-353

Olym'pus, Mount, ridge in n. Greece, separating Thessaly and Macedonia; about 10,000 ft. above sea level: G-153, map G-154

fabled home of gods Z-216

Omaha, tribe of Siouan Indians formerly living between Platte and Niobrara rivers in Nebraska I-54, O-225

houses I-59

Omaha (*ō-mā-hā*), Neb., largest city of state; pop. 223,844: O-225, map N-57

Oman (*ō-mān'*), independent state of s.e. Arabia on Persian Gulf, Gulf of Oman, and Arabian Sea; 82,000 sq. mi.; pop. 500,000, chiefly Arabs; exports dates; cap. Muscat (Masqat): A-237-8, maps A-242, A-332c

Oman, Gulf of, arm of Arabian Sea s. of Persia; connected with Persian Gulf by Strait of Ormuz: maps A-242, A-332c

Omar (*ō'mār*) (581?-644), 2d Mohammedan calif, organizer of Mohammedan power from warring sect to conquering nation and empire

Cairo founded by C-14

Omar, Mosque of, also Dome of the Rock, Jerusalem, built over rock supposed by Jews to be scene of the sacrifice of Isaac and, by Mohammedans, of the Prophet's ascension: J-211, picture A-329

Omar Khayyam (*kī-yām'*) (died 1123?), Persian mathematician, astronomer, and poet F-134

Oma'sum, or manypiles, third stomach of ruminants R-176

Omayyads. *See in Index* Ommyads

Ombu, evergreen tree (*Phytolacca dioica*) of pokeweed family, native to river courses of pampas of S. America. Grows to 60 ft.; thick trunk; spreading, flat crown; leaves oval, smooth; flowers white, in clusters. Sometimes called umbū, and "bella sombra."

Omdurman (*ōm-dūr-mān'*), Anglo-Egyptian Sudan, city on Nile River opposite Khartum; pop. 105,000; ivory, ostrich feathers, gum arabic: map E-197

Kitchener captures K-26

O'men, sign or indication of some future occurrence, favorable or unfavorable. Primitive peoples believe flight and feeding of birds, action or sounds of animals or insects, and other natural phenomena and accidental happenings betoken future events. *See also in Index* Augurs

O'miak, umiak, or oomiak, Eskimo boat C-76, I-82

Ommyads (*ō-mī'ādz*), Omayyads, or Umayyads, dynasty of califs or successors of Mohammed who asserted rule over Mohammedan Empire from death of Ali, 4th calif, to rise of Abbasids (661-750), and ruled in Spain (756-1031).

Omnibus bill, term applying to any

bill carrying several separate and unrelated measures, but particularly used for Compromise of 1850. Most states now require each statute to relate to one topic only.

Omodeo (*ō-mō-dā'ō*), Giovanni Antonio. *See in Index* Amadeo

Omo River, or Bottego River, Ethiopia, flows into Lake Rudolf, map E-308

Omphale (*ōm'fā-lē*), queen of Lydia whom Hercules served for three years as a punishment for having slain Iphitus; to please her Hercules wore her garments and spun wool while she wore his lion skin.

Omsk, distributing point for w. Siberia, on Irtysh River and Trans-Siberian Railway, 280 mi. s.e. of Tobolsk; pop. 280,000; seat of unsuccessful anti-Bolshevik government established by former Kerensky supporters, headed by General Kolchak: map A-332b

all-Russian government (1918) W-174, 175

Ona, Indian tribe of Tierra del Fuego S-206, picture S-205f

Onager (*ōn'ā-gēr*), a wild ass A-337

Onagraceae (*ōn'ā-grā'sē-ē*), the evening primrose family, a botanical group of chiefly herbaceous plants containing about 40 genera and 500 species; most abundant in temperate America; familiar members are evening primrose, willow-herb, fuchsia, and clarkia.

Onate (*ōn-yā'tā*), Juan de (1549?-after 1624), Spanish explorer and colonizer of New Mexico N-99, picture-map A-289

Onega (*ō-nā'gā*), Lake, also Oneskoe-Ozero, in n.w. Russia, 2d largest lake in Europe; 3700 sq. mi.; indented, rocky shores; outlet to White Sea, canal connection with Volga and Dvina; fisheries, timber trade: map E-326c

'**One-Hoss Shay**, The Wonderful', poem by Oliver Wendell Holmes; full title 'The Deacon's Masterpiece; or The Wonderful One-Hoss Shay'; tells how a carriage, built by a deacon so "that it couldn't fall down," fell to pieces all at once at the end of 100 years.

Oneida (*ō-nī'dā*), tribe of Iroquois Indians formerly living about Oneida Lake, N. Y., and s. to Susquehanna River; one of Six Nations: I-53

Oneida, N. Y., city 25 mi. e. of Syracuse; near Oneida Lake; pop. 10,291; silverware, caskets, furniture, auto bodies; canneries.

Oneida, Lake, N. Y., map N-114

Oneida Community, communistic religious settlement founded by John H. Noyes 1838, and established near Oneida, N. Y., 1847-48; dissolved 1879, and reorganized as Oneida Community, Ltd., a joint stock company engaged in the manufacture of silverware, with plants at Oneida, N. Y., Northampton, Mass., Niagara Falls and Toronto, Ontario, and Sheffield, England.

O'Neill, Eugene Gladstone (born 1888), American dramatist, born in New York City; son of James O'Neill, actor; was sailor, actor, reporter; broke dramatic conventions, attempting to reveal more of the perplexities of his characters than appear from the realistic surface; won Pulitzer prize three times, and Nobel prize, 1936 ('Beyond the Horizon'; 'Emperor Jones'; 'Anna Christie'; 'The Hairy Ape'; 'Strange Interlude'; 'Mourning Becomes

- Electra'; 'Desire Under the Elms'; 'Ah Wilderness!': D-97
- Onejskoe Ozero. *See in Index* Onega, Lake
- Oneonta, N. Y., market for dairy products, on Susquehanna River 65 mi. s.w. of Albany; pop. 11,731; railroad shops; gloves, silk and cotton cloth; Hartwick College; state teachers college.
- Onion, a biennial food plant O-225 bulb structure B-269 odor O-225 when and how to plant G-13
- Onions (*ō-ni'ōnz*), Oliver (born 1873), English novelist; had been illustrator and poster painter; a versatile and skilful writer of psychological novels, charming short stories of Yorkshire country life, and ghost stories ('In Accordance with the Evidence'; 'The Debit Account'; 'Mushroom Town'; 'The Painted Face'; 'Cut Flowers').
- Onnes, Heike Kamerlingh (1853-1926), Dutch physicist, winner of Nobel prize for physics 1913; discovered method of liquefying helium; professor of physics, Leyden University.
- Onomatopoeia (*ōn-ō-māt-ō-pē'yā*), formation of words in imitation of natural sound as "cuckoo," "hum"; in rhetoric, use of imitative and naturally suggestive words.
- Onondaga (*ōn-ōn-dā'gā*), Indian tribe of Iroquois group formerly living about Lake Onondaga, N. Y.; one of Six Nations: I-53, S-361
- Ontario, Calif., city 35 mi. e. of Los Angeles, pop. 14,197; grape and citrus fruit growing, dairying; electrical appliances; Chaffey Junior College; army air corps pilot training school.
- Ontario, Canada, a central province of Canada; 412,582 sq. mi.; pop. 3,431,683; cap. Toronto: O-226-7, map C-50b-c agriculture and dairying O-226, C-55 canals C-69; Sault Sainte Marie S-31-2; Welland Ship W-70 cities O-226, list O-226. *See also in Index* names of cities climate O-226 education C-64; Kingston K-23; London L-191; Ottawa O-254; Toronto T-113 Georgian Bay H-363 history O-227: rebellion of 1837 M-12 Laurentian Plateau L-72 lumber O-227, O-254 manufacturing O-226; Hamilton H-205; Kingston K-23; London L-191; Ottawa O-254; Sault Ste. Marie S-32; Toronto T-113 minerals O-226-7; emery E-260; platinum P-247 national parks N-23 Niagara Falls N-137-40 Ottawa, cap. of Dominion of Canada O-255 products, list O-226 St. Lawrence River S-7-9 Toronto T-112-13 transportation O-226
- Ontario, Lake, smallest of Great Lakes; 7540 sq. mi.: O-227, G-146-50a, maps G-146a, 147 height and depth, diagram G-146a Welland Ship Canal W-70
- Ontario Agricultural College, at Guelph, Ontario, Canada; founded 1874; agriculture, home economics, commercial baking.
- 'On the Bridge of Avignon', French folk-song F-134
- 'On the Crown', by Demosthenes D-49
- 'On the Morning of Christ's Nativity', poem by John Milton C-229d
- Onyx, a semiprecious stone G-28-9 Onyx marble M-60
- Oolatan (*ō'lā-kān*). *See* Candle-fish
- Oölite (*ō-ō-lit'ik*) limestone L-138, Q-2 quarrying Q-2; Indiana, picture I-49
- Oölite period, in geology, picture G-41
- Oolong (*ō'lōng*), a dark tea T-26
- Oo'miak, omiak, or umiak, Eskimo boat C-76, I-62
- Oospore, fertilized egg-cell in primitive plants S-75
- Oostende, Belgium. *See* Ostend
- Ooze, slimy deposit on sea bottom B-114
- Ooze, or suede, leather L-85
- OPA. *See in Index* Price Administration, Office of
- Opah. *See in Index* Moonfish
- Opal, a semiprecious stone consisting chiefly of silica and water; Sun God opal from a Persian temple, now in Field Museum, Chicago, is famous: G-29 artificially treated G-28 formed of quartz and water M-182 iridescence explained L-128 October birthstone G-25
- Opata (*ō-pā'tā*), a group of Indian tribes of the Piman linguistic stock living in the valleys of Rio Sonora and tributaries in Sonora, Mexico.
- Opechancanough (*ō-pē-chān'kā-nō*) (1548?-1644), great Indian warrior of Virginia, brother of Powhatan V-307
- Opel, Fritz von (born 1896?), German inventor and automobile manufacturer; head of Opel Auto Works until 1929 rocket plane F-62, picture A-66
- Open account, form of credit C-393
- Open-chain hydrocarbons, in chemistry. *See in Index* Paraffin series
- Open city, in military science, a city which claims immunity from bombardment or other violence on pledge that it will not be defended or used for military purposes.
- Open-cut tunnels T-153
- Open door policy, term used in international politics to designate equality of commercial opportunity to all nations China and the powers C-221k, M-16
- Open-hearth process, of steel manufacture I-135, 144, pictures I-133, 139, V-316
- Open Market operations, in securities F-22
- Open-pit mining M-188 asbestos, picture Q-4 asphalt, picture A-337 copper C-359, U-264, 266, picture U-265 iron I-135, 138, pictures I-134 "Open Sesame" (*sēs-ā-mē*), magical words in 'Arabian Nights' story of Ali Baba A-245
- Open shop, in industry L-44c
- Opequon (*ō-pēk'ōn*) Creek, near Winchester, Va., Civil War battle (also called battle of Winchester), Sept. 19, 1864; Federals under Sheridan defeated Confederates under Early: S-114-15, H-250, map C-253
- Opera (*ōp'ēr-ā*) O-228-34 Austria A-379 Chinese C-221g festivals at Bayreuth W-1 great names in opera O-228-9 Mozart's operas M-295 opera houses T-76 place in history of music M-314 stories of famous operas O-229-34 Wagner's influence W-1
- Opéra, L' (*lō-pā-rü*), theater in Paris, picture P-73
- Opéra bouffe (*ōp*) O-228
- Opéra comique (*kō-mēk'*) O-228
- Opera glass T-39 stereoscopic principle S-286
- Operations, surgical M-109 anesthetics A-196-7: Long's discovery L-191 antiseptic methods A-222
- Ophelia (*ō-fē'li-ā*), in Shakespeare's 'Hamlet', daughter of Polonius, beloved by Hamlet H-206
- Ophidia, suborder of reptiles comprising the snakes S-173
- Ophir (*ō'fēr*), ancient land mentioned in Bible S-192, M-294
- Ophiuchus (*ō-fi-yū'kūs*), constellation in Northern Hemisphere C-347, chart S-275d
- Ophthalmologist (*ōf-thāl-mōl'ō-jist*), or oculist, a physician who restricts his practise to the eye and its diseases S-240
- Ophthalmology (*ōf-thāl-mōl'ō-jī*) (from Greek meaning "eye" and "science"), a science which treats of the structure, functions, and diseases of the eye.
- Ophthalmoscope, an instrument for examining the interior of the living eye; invented 1851 by Hermann von Helmholtz.
- Opiates (*ō'pi-āts*) O-234, N-12
- O'pitz, Martin (1597-1639), German poet; head of so-called First Silesian School; called "father of modern German poetry."
- Opium O-234-5, N-12 China C-221a, O-234-5 poisoning, antidote P-275
- Opium poppy O-234, P-304, picture O-235
- Opium War (1839-42) C-221j
- Opopanax (*ō-pōp'ā-nāks*), a gum resin obtained from roots of a species of parsnip (*Pastinaca opopanax*); formerly important as an anti-spasmodic medicine; used in perfumery.
- Oporto (*ō-pōr'tō*), Portugal. *See in Index* Porto
- Opossum, small marsupial O-235 gray (Australia), picture A-372 woolly (Central and South America), picture N-29d
- Oppenheim, E. Phillips (born 1866), English writer of mystery stories and popular romances, especially of political intrigue ('The Great Awakening'; 'The Great Prince Shan'; 'The Fortunate Wayfarer').
- Oppenheim, James (1882-1932), author, born St. Paul, Minn.; supt. Hebrew Technical School for Girls, New York 1905-07; edited *The Seven Arts* ('Pay-Envelopes', short stories; 'The Sea', poetry).
- Oppen, Frederick Burr (1857-1937), cartoonist, born Madison, Ohio; illustrated for Bill Nye, Mark Twain, Dunne; created 'Happy Hooligan', 'Alphonse and Gaston', 'Our Antediluvian Ancestors'.
- Opposition, in astronomy, the relative position of two heavenly bodies when they are 180° apart in longitude; usually applied to the position of the moon directly opposite the sun, or a star opposite the sun Mars P-231
- Ops (*ōps*), in Roman mythology, wife of Saturn; goddess of plenty.
- Op'sonin, germ-fighting substance in the blood, picture G-79
- Optic, Oliver, pen name of William Taylor Adams (1822-97), author of boys' books; born Medway, Mass.; editor of *Oliver Optic's Magazine* ('Young America Abroad'; 'Starry Flag Series').
- Op'tical center, of lens L-97

Optical glass, any kind used in optical instruments G-104-5
Rochester manufactures R-121
Optical illusion I-19-20. *See also in Index* Illusions

Optical instrument, one designed to act upon light
field glass T-39
lens L-96-8
microscope M-156-8
periscope P-126
polariscope L-131
spectroscope S-241-4
telescope T-38-40

Optician (*öp-tish'än*), one skilled in the manufacture of spectacles and eye-glasses S-240

Optic nerve E-350, *diagram* E-349, *pictograph* N-64b

Optics, the branch of physics which deals with the phenomena of light. *See in Index* Light

'Optimism', a Little Talk by Arthur Mee O-236-7

Optometry (*öp-töm'ë-tri*), the scientific measuring of the refraction (visual power) and the muscular conditions of the human eye in order to prescribe lenses or prisms for correcting visual defects; the work done by an optometrist.

Opuntia (*ö-pün'shi-ä*), a genus of cacti C-10, 11

Opus, in music, a work, or composition, or a group of compositions.

Or, in heraldry H-281

Orach (*ör'äch*), an annual plant (*Atriplex hortensis*) of the goose-foot family; native to Asia; grows to 6 ft.; leaves arrow-shaped; some varieties have reddish leaves and stocks; can be boiled and eaten like spinach.

Oracle (*ör'-ä-kl*), Delphic D-44
consulted by: Cadmus C-11; Croesus C-399; Lycurgus L-222
on Persian War A-11

Oracle bones, China C-221i

Oracle of Zeus, at Dodona D-44

Oradea Mare (*ör-ä'dä-ä mä'rä*), German Grosswardein, old Hungarian town about 135 mi. s.e. of Budapest; founded by St. Ladislaus (1080); pop. 82,000; important railroad junction; potteries; agricultural trade: *map* E-326e

Oral surgery V-322

Oran (*ö-rän'*), Algeria, seaport and naval base on n. coast of Africa, 230 mi. s.w. of Algiers; pop. 200,000; exports cereals, olives, wine, tobacco, hides, and cattle; after centuries of Moorish or Spanish domination, was occupied by French in 1831: *maps* A-127, A-42a

Orange, Conn., manufacturing town 6 mi. s.w. of New Haven; trade center for productive agricultural region; pop. 2009.

Orange, N. J., residential and manufacturing suburb 12 mi. w. of New York City; pop. 35,717; hats, electrical machinery, calculating machines; Orange, and East, West, and South Orange form "the Oranges": *map* N-90

Orange, principality in s.e. France; fell to House of Nassau in 1531, under Nassau-Orange family until 1702, annexed to France in 1714. *See in Index* Orange, House of

Orange, a citrus fruit O-238-40
California production O-238, *pictures* C-27, F-211

citric acid, *picture* A-10
Florida production F-111, O-238
groves O-238, *pictures* O-239, F-211
growing and packing O-238-40:
automatic A-384
introduced into Europe C-406

navel, origin O-238

old trees at Versailles V-289

pests and diseases O-238: mealy bug I-90

seedless O-238

vitamin C, rich in V-311a

Orange, a color

eye reaction C-308j

hue and value C-308d, *color chart* C-308c

mixtures C-308b, f-i

place in spectrum, *picture* C-308a

secondary color, *color charts* C-308b, c, h

wave-length of light S-242

Orange, House of, princely family whose heads were sovereigns of Orange (s.e. France); also held large possessions in the Netherlands and thus became defenders of Dutch liberty against Spanish oppression, and ancestors of present Dutch royal line: N-73

William the Silent W-103

William III of England W-102-3

Orange, osage. *See* Osage orange

Orangeburg, S. C., city 35 mi. s. e. of Columbia; pop. 10,521; agricultural products; Claflin College (for Negroes) and State Colored Normal, Industrial, Agricultural, and Mechanical College.

Orange Day, anniversary of the Battle of the Boyne (July 12, 1690), an annual celebration in Northern Ireland.

Orange Free State, province of Union of South Africa; 49,647 sq. mi.; pop. 775,000; cap. Bloemfontein: O-240, S-202-3, *maps* S-202, A-42a
Boer War B-166-7, S-201-2
diamond fields S-201

Orange Lake, in n. Florida, about 14 mi. long.

Orangemen, members of Orange Society of Irish Protestants (essentially political) originating in Ulster; name derived from King William III (Prince of Orange): I-127

Orange-peel dredge D-104

Orange pekoe tea, *picture* T-22

Orange River, large river in South Africa; flows 1100 mi. into Atlantic: A-38, *maps* S-202, A-42a
discovery of first diamond D-59

Orange root. *See in Index* Goldenseal
Orang-utan (*ö-räng' g-tän'*), an anthropoid ape O-240, A-225-6
hand, *picture* A-225

Oratorio, in music, a composition similar to an opera but founded on a biblical theme and usually given without action or scenery
Handel develops H-209-10

Or'atory R-92-3

Cicero C-235-6, L-68

famous American orators A-177:
Daniel Webster W-62-3; Patrick Henry H-279-80

Greek G-173: Demosthenes D-49

'Orbis Pictus' (The World in Pictures), by John Comenius, the first picture-book for children L-157

Orbit, astronomical, path taken by a heavenly body in moving about its center of attraction

asteroids A-339, *picture* A-340

comets C-320

earth E-132-3, *picture* E-133

planets P-233, *chart* P-230: Kepler's laws K-15

Orcagna (*ör-kän'yä*), common name of Andrea di Cione (1308?-68?), also called Arcagnuolo, Italian sculptor, painter, architect, musician, and goldsmith; noted for frescoes in Strozzi chapel of church of Santa Maria Novella, Florence; also for tabernacle, or canopy, over Bernardo Daddi's painting of the

Madonna in the Or San Michele, Florence: S-57

Orchard F-212-14. *See also in Index* Fruit and fruit growing

Orchard Knob, Tennessee

Civil War C-157, *map* C-157

Orchard oriole O-251

Orchardson, Sir William Quiller (1835-1910), Scottish painter, born Edinburgh; famous for portraits, historical scenes, and genre paintings ('Lord Peel'; 'Voltaire'; 'Napoleon on Board the Bellerophon'; 'Mariage de Convenience'; 'A Tender Chord').

Orchestra (*ör'hës-trä*) O-240-3
early compositions M-312, 313
part of theater T-76

Orchid (*ör'kid*), family of flowering plants O-243, F-116, *picture* O-242
lady's slipper L-53
vanilla-producing types V-273

Orehidaceae (*ör-kî-dä'së-ë*), orchid family O-243

Orchomenus (*ör-köm'ë-nüs*), ancient Greek city in Boeotia; great continental and maritime power in prehistoric times; cap. of the Minyae; superseded by Thebes.

Or'deal, trial by J-231

Order, in biological classification, a group of related families B-116

bird orders B-132

mammal orders Z-229-30, M-44

reptile orders Z-229

Order for Merit, Germany D-32

Order in Council, in Great Britain any order issued by the sovereign on advice of the privy council
in Napoleonic Wars W-8, 9

Order of Christ, founded in 1518 by King Diniz of Portugal and by Pope John XXII; papal branch continues as the Supreme Order of Christ; the Portuguese branch was made distinct in 1522 and secularized in 1789.

Order of Golden Militia, or Golden Spur, papal order founded 1559 by Pope Paul IV; absorbed in 1841 by the Order of St. Sylvester.

Order of Leopold, Belgium D-32

Order of Merit, England D-35

Order of Pius IX, papal order founded 1847 by Pope Pius IX; awarded to nobility for virtue and merit.

Order of St. Gregory the Great, papal order founded 1831 by Pope Gregory XVI; given to those who have done distinguished work for the Church.

Order of St. Sylvester, papal order founded 1841 when it absorbed the Order of Golden Militia.

Order of the Bath D-35
stalls, Westminster, *picture* W-139

Order of the Holy Sepulcher, papal order founded probably in 1496 by Pope Alexander VI (traditional foundation dates from 1099).

Orders, religious M-232-6. *See in Index* names of various orders

Orders of architecture, Greek A-260-1, *picture* A-259

Orders of Foresters. *See in Index* Foresters, Orders of

Orders of knighthood D-35

crusading orders C-406, C-404

papal orders D-35

Or'dinal numbers C-83

Ordinance of 1785, U.S., on western lands A-318

Ordinance of 1787, U.S., statute governing Northwest Territory N-171, A-318

provided for territorial government U-232

Ordinances of Justice, in Florence F-107

- Ord'nance, heavy firearms, such as mortars and cannon A-319-22. *See also in Index* Artillery
- Ordnance Department, U.S. Army A-307a
- insignia, picture U-178
- Ordovician (*ôr-dô-vish'an*) period, in geology G-40, picture G-41
- Ordzhonikidze. *See in Index* Caucasias
- Ore (*û'ri*), a bronze coin, one hundredth of a krone in value, worth at face value about 2/5 cent; used in Denmark, Norway, and Sweden.
- Oreads (*ô'rê-âdz*), in Greek mythology, mountain nymphs N-188
- Orebro (*û-rû-brô'*), Sweden, manufacturing and trade town on Svarta River near w. end of Lake Hjälmaren; pop. 38,000; diet of 1540 declared crown hereditary; diet of 1810 made Bernadotte crown prince.
- O'regon, a n.w. state of U.S.; 96,981 sq. mi.; pop. 1,089,684; cap. Salem: O-243-8, maps O-246, U-188b
- agriculture O-244, 246; apples A-231; prunes P-358
- bird, state B-122
- cities, list O-243. *See also in Index* names of cities
- climate O-244; rainfall R-48
- education O-246
- flag F-93, color plate F-87
- flower, state S-279
- forests, national and state, table F-250
- history O-246-8: boundary dispute P-296; early settlers F-15, 16; Whitman's work W-94; separation of Washington Territory W-30; initiative and referendum I-79
- irrigation I-149
- lumber O-246, P-307
- minerals O-246
- name, origin of, and nickname S-279
- national park and monument N-21, 22c, picture N-17
- natural features O-244: Columbia River C-315-16
- Owyhee Dam, table D-357
- pheasants introduced P-157
- products O-244-6, list O-243
- salmon S-13, O-246, picture O-245
- 'Oregon', U.S. battleship, built 1896; junked Aug. 1942 for metal to be used in 2d World War
- in Spanish-American War S-234
- Oregon, University of, at Eugene, Ore.; state institution; opened 1876, chartered 1872; college of literature, science, and arts; schools of applied social science, architecture and allied arts, business administration, education, journalism, law, medicine, music, physical education; graduate school: picture O-245
- Oregon ash, tree (*Fraxinus oregona*) of olive family, found in moist valleys from Washington to California; grows to 75 ft. Wood strong, used for tool handles, barrels, furniture, and fuel. Sometimes called water ash.
- Oregon Boundary Treaty (1846), between United States and Great Britain settling w. Canadian boundary O-247
- Oregon Caves, national monument in Oregon N-22c
- Oregon cedar. *See* Port Orford cedar
- 'Oregon Country' O-243
- Oregon grape, a small shrub (*Mahonia aquifolium*), of the barberry family with prickly evergreen leaves and dainty yellow flowers followed by clusters of acid blue berries, which resemble small grapes; Oregon state flower.
- Oregon maple. *See* Bigleaf maple
- Oregon myrtle. *See* California laurel
- Oregon pine. *See* Douglas fir
- Oregon plan, in legislation I-79
- Oregon question, dispute with Great Britain O-247
- Polk and "reoccupation" P-296
- Oregon State College, institution of higher education at Corvallis, Ore.; incorporated 1858 as Corvallis College; became state college 1868.
- Oregon Trail, emigrant route from Independence, Mo., to Fort Vancouver on the Columbia River F-15-16, T-126, map U-242
- Parkman's book about P-76
- O'Reilly, John Boyle (1844-90), Irish-American poet, politician, and journalist; sent to penal colony in Australia because of revolutionary activities in Ireland; escaped and settled in Boston, Mass.; editor of *The Pilot*, Roman Catholic newspaper ('Songs of the Southern Seas'; 'Moondyne'; 'America').
- O'Rell, Max, pen name of Paul Blouet (1848-1903), French satirical writer, born in England; taught in St. Paul's School and in University of London; books written in French and translated into English ('John Bull and His Island'; 'A Frenchman in America'; 'John Bull and Co.').
- Orellana (*ô-rêl-yânâ*), Francisco de (1490?-1549?), Spanish explorer; discovered course of Amazon River in 1541: S-208l
- Ore Mountains, or Erz Gebirge, low range between Saxony and Bohemia, maps A-381, G-66
- Orenburg, also Chkalov, capital of government of Orenburg in e. European Russia, on Ural River; pop. 175,000; frontier caravan center, large cattle trade: map E-326e
- Ores, minerals containing metals or other valuable substances. *See also in Index* names of metals
- assaying A-338
- extracting metal M-122-3
- radio detection of deposits R-25
- Orestes (*ô-rêstêz*), in Greek mythology, son of Agamemnon and Clytemnestra; killed his mother because she had killed his father
- Aeschylus' dramas G-172, F-218
- Orford, Earl of. *See in Index* Walpole, Horace; Walpole, Sir Robert
- Organ, a musical instrument O-248-50
- electric O-250
- 15th century, picture M-315
- harmonium, reed or cabinet organ O-250, picture M-322
- pipe organ O-248-50, pictures O-248, 249, M-322
- tone production S-197, O-248, 250
- Or'gandy, a fine, sheer cotton fabric, with smooth, crisp finish.
- Organ'ic acids, in chemistry C-176b
- acetic V-300
- amino acids B-109
- benzoic C-289
- carbolic (phenol) C-81-2
- citric, in lemons L-94
- fatty S-175, 177, F-19
- hydrocyanic C-418-19
- lactic D-4, M-173, B-110
- salicylic C-289
- tartaric T-14
- Organic Act of 1884, for administration of Alaska by U.S. A-103
- Organic chemistry, branch of chemistry dealing with compounds of carbon C-176a, B-109-11, Outline C-181. *See also in Index* Carbon
- Organic evolution, the evolution of living organisms E-341. *See also in Index* Evolution
- Organism, in biology C-122
- Organized labor. *See* Labor movement
- Organized Reserves, U.S. Army A-307c-d
- Organ of Corti, in the ear E-127
- Organol'ogy, of plants, defined B-203
- Organon (*ôr'gû-nôn*), the Greek word for "instrument"; the title applied to Aristotle's treatises on logic, because logic is the tool of thought.
- Organ Pipe Cactus, national monument in Arizona N-22c
- Or'ganzine, a silk thread S-148
- Oriel (*ô'ri-êl*) College, Oxford O-260, picture O-259
- O'rient, meaning of word A-332
- Oriental amethyst, purple variety of corundum used as gem stone.
- Oriental cockroach, sometimes called the "black beetle"; only the male has functional wings: C-291, 292
- Oriental emerald, green variety of corundum used as gem stone.
- Oriental Institute Museum, at Chicago, Ill., table M-392
- Oriental lace L-48
- Oriental leaf butterfly, Indian leaf butterfly, dead leaf butterfly, or Kallima P-354, pictures P-355, I-85
- Oriental peach moth, a lepidopterous insect (*Laspeyresia molesta*) I-89
- Oriental poppy, a perennial plant (*Papaver orientale*) of the poppy family, native to Mediterranean region and Persia. Grows to about 4 ft.; leaves lobed, toothed, hairy; flowers scarlet with black spot at base of each petal, or orange, pink, or white, sometimes double.
- Oriental region, one of the six great zoogeographical divisions of the world Z-230
- Oriental rugs R-171-3
- in interior decoration I-107
- prayer rug R-171, color plate R-170a-b
- varieties R-172-3
- Oriental sculpture S-64-5, Outline S-66
- Oriental topaz, a semiprecious stone G-29
- Orientalwood, also called Australian or Queensland walnut and Australian laurel, an important veneer wood obtained from huge laurel tree (*Endiandra palmerstonii*) that grows in coastal regions of Queensland.
- Orientation course, in colleges U-259
- Oriflamme (*ôr'i-flâm*) (golden flame), royal standard of France in medieval times; originally the bright red three-tongued banner of the abbey of St. Denis: F-84
- Origen (*ôr'i-jên*) (185?-254?), early Christian theologian, native of Alexandria, Egypt; exerted great influence in his day and for some time later; sought to reconcile Platonism and Christianity.
- 'Origin of Species', book by Darwin D-16, B-115, E-340
- cats and red clover, relation E-145b
- Oril'ia, Ontario, summer resort, railroad and industrial town on Lake Simcoe, 64 mi. n. of Toronto: pop. 8183; smelting works, planning mills, clothing, furniture, boats.
- Orinoco (*ô-rê-nô'kô*) River, 3d largest river of South America O-250, V-275, S-208f, maps V-276, S-208b-c
- Columbus discovers S-208l
- Raleigh's expeditions R-50, O-250
- Oriole (*ô'ri-ôl*) O-250-1, picture O-250, color plate B-137
- nest B-126, pictures B-127, O-250
- Orion (*ô-r'ôn*), in Greek mythology hunter loved by Artemis O-251
- Pleiades and P-259
- Orion, a constellation O-251, C-347
- location, charts S-275, 275f, h
- nebula N-60
- Oriskany (*ô-ris'kâ-nî*), N.Y., village 7 mi. n.w. of Utica; pop. 1115; bloody but indecisive Revolutionary battle between Americans under

General Herkimer and British and Indians (under St. Leger and Joseph Brant), Aug. 6, 1777; Herkimer mortally wounded.

Oristano (*ô-rës-lä'nô*), Gulf of, on w. coast of Sardinia, map I-156

Orizaba (*ô-rë-sä'bä*) Mount, also Citlalteptl, highest peak in Mexico (18,700 ft.); 175 mi. s.e. of Mexico City: M-132b, 142, map M-133, picture M-135

earthquake in district, table E-136

Orkhan (*ôr-kän'*) (1326-59), sultan of Turkey T-162

Orkney Islands, Scotland; 375 sq. mi.; pop. 25,000: O-251, map E-270a

Orlan'do, lover of Rosalind in 'As You Like It' A-322

Orlando (*ôr-län'dô*), Vittorio Emanuele (born 1860), Italian statesman; favored intervention in 1st World War; prime minister 1917-19; one of leaders at Peace Conference, results of which led to fall of cabinet June 1919: picture U-249

Orlando, Fla., city in cent. Florida; pop. 36,736; orange shipping; lumber and wood products; Army air base 2½ mi. e.: map F-112

'Orlando Furioso' (*ô-rô-ô'zô*), poem by Ludovico Ariosto I-154, S-303h puppet performance P-368c

Orleanists, in French politics, supporters of House of Orleans Burgundians and (15th century) C-150

Louis Philippe (19th century) L-203

Orléans (*ôr-lä-än'*), dukes of, heads of a younger branch of French royal house of Bourbon.

Orléans, Louis Philippe, Duke of (1747-93), "Philippe Egalité," the regent's great-grandson; as "Citizen Equality" was elected Paris deputy to Convention 1792; voted for death of Louis XVI; executed under the Terror. His son was Louis Philippe, king of the French.

Orléans, Philip, Duke of (1674-1723), regent of France during minority of Louis XV; able but dissolute and corrupt; supported "Mississippi Bubble" scheme.

Orléans, Maid of. See in Index Joan of Arc

Orléans, France, historic city; pop. 75,000: O-251

Joan of Arc at J-220, picture H-359

Orleans (*ôr-lë-änz*), a town in n. Vermont, 44 mi. e. of St. Albans; furniture; pop. 1332: V-287

Or'lof, a famous diamond D-62-3, picture D-63

Or'mandy, Eugene (born 1899), Hungarian-American conductor, born Budapest; came to America 1921; conductor Minneapolis Symphony Orchestra 1931-36; became conductor of Philadelphia Orchestra, 1936.

Ormuzd (*ôr-müz'd*), Ormuzd, or Ahura Mazda, spirit of good in Zoroastrian religion Z-231

Or'molu, an alloy A-132 gilded bronze, decoration I-101

Or'muz, a small barren island at entrance to Persian Gulf; in Middle Ages headquarters of trade between Persia and India.

Ormuz, Strait of, map A-242

Ormuzd, Ormuzd, or Ahura Mazda, supreme god in Zoroastrian religion Z-231

Orne (*ôrni*) River, in Normandy, France; flows n. 95 mi. to English Channel.

Ornithogalum (*ôr-ni-thôg'ä-lüm*), a genus of perennial plants of the lily family; native to the Eastern Hemisphere; the Cape Chinch-

ichee (*O. thrysoides*) has a striking triangular cluster of white, apricot, or yellow flowers. Star-of-Bethlehem is *O. umbellatum*.

Ornithologists' Union, American B-145d

Ornithology, a division of zoölogy, which deals with study of birds. See in Index Birds

Ornithop'ter, a theoretical flying machine with flapping wings, picture A-66

OrNSTEIN, Leo (born 1895), American pianist and composer, born in Russia; ultra-modern in earlier compositions; declared he was "not concerned with form or with standards of any nature" ('Wild Man's Dance').

O'rono, Me., town on Penobscot River 8 mi. n.e. of Bangor; pop. 3702; canvas products, pulp and paper; University of Maine: map M-38

'Oroono'ko', title of a novel by Alphra Behn dealing with the mistreatment and tribulations of an African prince sold as a slave in Surinam (Dutch Guiana).

Orozco (*ô-rôs'kô*), José Clemente, Mexican artist of modernist school, famous for powerful black and white drawings and caricatures as well as for paintings; did murals for New School for Social Research, New York, Pomona College, Calif., and library at Dartmouth College: L-67k

Orpah, in Bible, sister-in-law of Ruth R-201

Orpen, Sir William (1878-1931), British painter, born Dublin, Ireland; famed for his portraits which show broad and free technique and original illumination; official British artist during 1st World War; knighted 1918.

Orpheus (*ôr'fë-üs*), in Greek mythology, musician of marvelous powers O-251-2

'Orpheus and Eurydice', by Watts, picture O-252

Orpiment, a sulphide of arsenic M-182

Orpine (*ôr'pin*) family, or Crassulaceae (*kräs-ü-lä'së-ë*), a family of plants and shrubs including the houseleek, the sedums, live-forever, the kalanchoes, and the echeverias.

Or'pington, a breed of poultry P-338, picture P-337

Orrefors glass, picture G-104

Orris-root (corruption of "iris root") I-130

Or San Michele (*ôr sän mē-kä'lä*), Madonna of, famous painting by Bernardo Daddi in the Or San Michele, a building of the grain merchants, later converted into a church; this Madonna was declared on Aug. 13, 1365, by the Florentine Republic, to be the protectress of the Florentines; it is enshrined in a tabernacle of Florentine Gothic style by Orcagna: S-57

Orsini (*ôr-së'në*), a noble Roman family, which first appears prominently in 12th century; conflict with Colonna, a rival family, kept Rome in a turmoil for several centuries; two of its members became popes (Celestine III and Benedict XIII).

Orsova (*ôr'shô-vä*), Rumania, a fortified island-town on the Danube River near the Iron Gates; pop. 5000: maps B-18, A-381

Orsted, Hans Christian. See in Index Oersted

Orteig, Raymond (1871-1939), French restaurateur and patron of avia-

tion; born Louvie Juzon, France; came to New York City as a boy; owner of Hotel Lafayette

prize won by Lindbergh L-147

Orthochromatic film P-185

Orthoclase, a glassy, variously colored silicate of potassium and aluminum M-184

Orthodon'tia, in dentistry V-322

Orthodox Eastern church, or Orthodox Greek church. See in Index Greek Orthodox church

calendar, new style accepted C-23

Orthog'raphy, correct or standard spelling; from Greek meaning straight or correct writing. See in Index Spelling

Orthop'tera, an order of insects; winged members have two pairs of straight wings; most familiar representatives grasshoppers, locusts, crickets, katydids, cockroaches.

Orthorhombic crystals M-182

Ortiz (*ôr-tëth'*), Juan (died 1542), Spanish adventurer, survivor of Narváez's expedition; captured by Indians on return to Florida from Cuba; rescued after 11 years by De Soto's men; interpreter for De Soto 1539-42.

Ort'ler, highest point in Tyrol and in eastern Alps (12,800 ft.).

Or'tolan, a bunting B-273

Oruro (*ô-rô'rô*), a town in w. Bolivia, a railroad and tin-mining center; pop. 41,000: map S-208b

Orvieto (*ôr-vë-yä'tô*), Italy, town and Episcopal see in province of Perugia, 80 mi. n.w. of Rome; built on a rock, commanding fine views; numerous 13th-century houses and palaces; Gothic cathedral begun in 1290; pop. 19,000.

O'ryx, a species of antelope, picture A-33, color plate A-36b

Osage (*ô-säg'*), a tribe of Plains Indians of Siouan stock which originally ranged from Arkansas to Missouri rivers I-54

oil wealth U-186

Osage orange, North American tree (*Maclura pomifera*) with inedible fruit, resembling a large orange; wood bright yellow, fine grained, and very elastic

hedges H-269

Osage River, a tributary of the Missouri in Kansas and Missouri; 500 mi. long: O-266, map M-208

Osaka (*ô-sä-kä*), 2d city and chief manufacturing center of Japan on Osaka Bay; good harbor; pop. 3,255,000: O-252, maps A-332b, J-186, picture J-191b

Osawatomie (*ôs-ä-wat'ô-mi*), Kan., city 45 mi. s.w. of Kansas City; pop. 4145; attack of pro-slavery men 1856 resisted by John Brown and followers; latter finally overpowered and town practically destroyed

battle B-250

"Osawatomie Brown," nickname of John Brown (1800-59), American abolitionist B-250

Osborn, Chase Salmon (born 1860), ex-governor of Michigan, born Huntington County, Ind.; newspaper publisher, 1883-1912; governor of Michigan, 1911-12; agitated for inclusion of Great Lakes water areas in official areas of adjoining states; wrote 'The Iron Hunter', 'The Earth Upsets'.

Osborn, Henry Fairfield (1857-1935), American paleontologist, born Fairfield, Conn.; associated with American Museum of Natural History from 1891; president 1908-1933; with U. S. Geological Survey from

- 1900; research professor zoölogy, Columbia University, from 1910 ('Men of the Old Stone Age'; 'Origin and Evolution of Life'; 'Impressions of Great Naturalists'; 'Creative Education').
- Osborne, Thomas Burr** (1859-1929), American chemist, born New Haven, Conn.; authority on proteins in feeding; did experimental work on vitamins.
- Osborne, Thomas Mott** (1859-1926), prison reformer, born Auburn, N. Y.; as warden of Sing Sing (1914-16) and of Portsmouth Naval Prison (1917-20) applied his Mutual Welfare League plan; wrote 'Society and Prisons', 'Prisons and Common Sense'.
- Osborne, estate near East Cowes, Isle of Wight**, now seat of convalescent home for army and navy officers and of a Royal Navy College. British royal residence W-97.
- Osbourne, Fanny de Grift** (1840?-1914), wife of Robert L. Stevenson S-288.
- Osbourne, Lloyd** (born 1868), American author, stepson of Robert Louis Stevenson S-288.
- Os'car I** (1799-1859), king of Sweden and Norway, son of Bernadotte (Charles XIV); succeeded to throne 1844.
- Oscar II** (1829-1907), king of Sweden and Norway (1872-1905), king of Sweden (1905-07); musician and author ('Memoirs of Charles XII').
- Osceola** (*ös-ë-ö-lá*) (1804?-38), Seminole Indian chief, leader of 2d Seminole War; treacherously seized under flag of truce, died in captivity.
- Oscillation**, of electric current R-17, 26
applied to clocks W-41
vacuum tube arranged to create R-22
- Oscilloscope**, device for detecting deflection of electrons in vacuum tubes E-242, *picture* E-243
television apparatus T-41
- Oscines** (*ös't-néz*), scientific name for song-bird group.
- Osel.** See in *Index* Saaremaa
- Osgood, Frances Sargent Locke** (1811-50), American poet, born Boston, Mass.; published many poems and a few prose tales; friend of Edgar Allan Poe.
- Osgood, Samuel** (1747?-1813), American soldier and politician, born Andover, Mass.; fought in American Revolution; member of Continental Congress (1781-84), commissioner of treasury (1785-89), postmaster general (1789-91).
- O'Shaughnessy** (*ö-shg'ně-si*), Arthur William E. (1844-81), English poet; verses of haunting beauty ('Epic of Women'; 'Lays of France'; 'Music and Moonlight').
- Osh'awa**, Ontario, Canada, city on Lake Ontario, 30 mi. n.e. of Toronto, in agricultural district; pop. 23,439; automobiles, glass products, iron castings, textiles: *map*, inset C-50b
- O'Sheel, Shaemas** (born 1886), American poet and critic, born New York City; poetry imaginative, sensitive, and mystical, strongly influenced by Irish ancestry ('He Whom a Dream Hath Possessed').
- Osh'kosh, Wis.**, city at junction of Fox River and Lake Winnebago, 75 mi. n.w. of Milwaukee; pop. 39,089; textiles, leather goods, shoes, woodwork, rugs and carpets, automobile bodies and parts; state teachers college: W-126, *map* W-124
- Osiers** (*ö-zhērz*), willows W-105
- Osiris** (*ö-s'ris*), ancient Egyptian deity O-252, E-203
Isis wife and sister of I-152
- Oskaloo'sa**, Iowa, agricultural center 65 mi. s.e. of Des Moines; pop. 11,024; valves, wood toys, clay products; William Penn College: *map* I-120
- Os'ler, Sir William** (1849-1919), Canadian physician, born Bondhead, Ontario; professor of medicine at Johns Hopkins University 1889-1904, and at Oxford after 1905; made valuable studies of the spleen and blood. His allusion to "comparative uselessness of men over 40" has been sadly misquoted, to the point of crediting him with saying that men at 60 should be done away with.
- Oslo** (*ös'lö*), formerly Christiania (name changed 1925), cap. and chief seaport of Norway; pop. 250,000: O-252, *maps* N-173, E-326d, *picture* N-177
winter sports N-172
- Oslo Fjord** (*ös'lö fë-yörd'*), Norway, wide, shallow inlet opening off Skagerrak and Kattegat O-252
- Osman I, or Othman I** (1259?-1326), Turkish sultan, founder of Ottoman Empire.
- Osmium**, a chemical element; rare bluish-white metal, very hard and heavy: C-176, *table* C-168
found with platinum P-247
- Osmium-irid'ium**, or *osmiridium*, a rare alloy A-133
- Osmo'sis** P-239
blood in capillaries H-259
plants P-239-40, *pictures* P-237
- Osnabrück** (*ös-nü-brük'*), or *Osnaburg*, industrial town of Hanover, Prussia, on Hase River 30 mi. n.e. of Munster; pop. 89,000; iron and steel manufactures; member of Hanseatic League: *map* G-66
- Os'naburg**, originally a coarse linen cloth made in Osnabrück (or Osnaburg), Germany; now a strong cheap, unbleached cotton fabric, used chiefly for sacking.
- Osorno** (*ö-sör'nö*), Chile, distributing center for farming, dairying, and stock-raising region, about 600 mi. s. of Santiago; pop. 16,000; tourist center: C-207c, *map* C-206
- Osorno, Mt.**, volcanic peak in s. Chile, *picture* S-205a
- Os'prey**, or *fish hawk* H-246-7
- Os'sa**, Mount (modern Kissovo), in Thessaly. See in *Index* Pellon
- Os'sa innomina'ta** (nameless bones), the hipbones S-156
- Ossein** (*ös'e-in*), chief organic element of bone tissue, supplying toughness B-172
- Ossendowski** (*ös-sën-döf'skë*), Ferdinand Anthony (born 1876), Polish scientist, explorer, and writer, imprisoned by Russian government, wrote books on Russian prison system; 'Beasts, Men and Gods' recounts journey through Asia.
- Ossian** (*ösh'an*), or *Oisín* (3d century A.D.), legendary Irish bard, son of Finn; supposed author of Macpherson's 'Poems of Ossian' published in 1760: I-132
- Ossification**, change of cartilage into bone in human beings B-172
- Ossining'** (formerly Sing Sing), N.Y., residential village on Hudson River 31 mi. n. of New York City; pop. 15,996; stoves, clothing, engines, drugs; Sing Sing State Prison is just south: *map* N-114
- Os'soli, Margaret Fuller**. See in *Index*, Fuller, Margaret
- Ostade** (*ös-tád'-dä*), Adrian (1610-85), Dutch painter, pupil of Hals; vigorous treatment of rustic life.
- Ostade, Isaac** (1621-49), Dutch painter, brother of Adrian; noted for winter landscapes.
- Ostend** (*ös-tënd'*), Belgium, also *Oostende*, seaport and resort on North Sea, 67 mi. n.w. of Brussels; pop. 44,000; repeatedly shelled in 1st World War; harbor closed by British by sinking of ships May 10, 1918; became temporary capital of Belgium 1940: B-88, *map* B-87
- Ostend Manifesto** (1854) C-250-1, P-214
- Osten'so, Martha** (born 1900), American novelist, born Bergen, Norway; family came to America when she was 2, and lived in Minnesota, South Dakota, and Manitoba; won prize, 1925, with 'Wild Geese', stark, realistic novel of northern prairie ('Dark Dawn'; 'The Mad Carews'; 'The Young May Moon'; 'The Waters under the Earth').
- Osteology**, the science or study of the bones.
- Osteopathy** O-253
- Österreich**, German name of Austria meaning "eastern realm"; changed to Ostmark, or "eastern province," in 1938.
- Ostia** (*ös'ti-ä*), ancient port of Rome at mouth of Tiber now mostly covered with sand; important ruins revealed by excavations; modern Ostia about ½ mile from ancient site.
- Os'tiaks**, tribe of Finno-Ugric group inhabiting Ob Valley in w. Siberia; their language is related to Magyar tongue.
- Ostmark**, second largest state of Germany (former Austria). See in *Index* Austria
- Ostracism** (*ös'trä-sizm*), in ancient Greece, banishment by popular vote Aristides A-282-3, *picture* G-155
- Os'trakon**, ancient ballot A-283
- Os'trea**, the oyster genus of mollusks O-262
- Os'trich**, the largest of living birds O-253
egg O-253, *picture* E-193
farming O-253
feathers O-253
foot O-253, *picture* B-129
length of life, average, *pictograph* A-198
- Ostrosky** (*ös-tröf'skë*), Alexander Nikolaevich (1823-86), Russian dramatist, born Moscow; studied law; noted for realistic comedies and tragedies built around middle-class Russian life ('The Storm'; 'Poverty Not a Vice'; 'The Bankrupt').
- Os'trogoths, or East Goths** G-123-4
- Ostrolenka** (*ös-trö-lëng'kä*), Poland, town 60 mi. n.e. of Warsaw; pop. 15,000; French defeated Russians 1807 and Russians suppressed Polish uprising 1831; changed hands frequently in 1st World War.
- Ostwald** (*öst'vält*), Wilhelm (1853-1932), German chemist; professor of chemistry, University of Leipzig; leader in modern physical chemistry; Nobel prize winner in chemistry 1909; aided Germany in 1st World War by discovering new method of making from ammonia the nitric acid and nitrates needed for explosives.
- Oswego, N.Y.**, port and reshipment point for coal, grain, and lumber on Lake Ontario at mouth of Oswego River; pop. 22,062; machinery, matches, knit goods; state

teachers college; Fort Ontario: *map* N-114
 formerly starch manufacturing center S-276
 state normal school E-181
Oswego Canal, the 24 mi. canalized Oswego River in New York, entering Lake Ontario at city of Oswego; part of New York State Barge Canal: N-119, *map* N-114
Oswego tea, bee-balm, or fragrant-balm, a tall showy perennial herb (*Monarda didyma*) of the mint family and horsemint genus; brilliant red or pink flowers.
Otaru (*ô-tâ-rô*), Japan, chief town on s.w. coast of Hokkaido Island on s. shore of Ishikari Bay; pop. 165,000; marine experiment station; fisheries; large trade: *map* J-186
'Otel'lo, opera by Verdi O-232, V-282
Otero (*ô-tâ-rô*), Lake, extinct lake in New Mexico N-96
'Othello', tragedy by Shakespeare O-253-4
 chronology and rank S-100e
Oth'man I, or Osman I (1259?-1326), Turkish sultan, founder of Ottoman Empire.
Otho, Holy Roman emperors. See in Index Otto
O'tis, Elisha Graves (1811-61), born Halifax, Vt.; inventor of elevator improvements E-251
Otis, Elwell Stephen (1838-1909), American soldier, born Frederick, Md.; served Federal army in Civil War; military governor and commander of forces in Philippines; major general 1900.
Otis, James (1725-83), American Revolutionary orator O-254
 burial place, Boston B-200
Oto, Indian tribe of Siouan stock; after various migrations from Wisconsin to Iowa and Nebraska were removed to Indian Territory (Oklahoma) in 1882: I-54
O'toliths, of ear E-127
Otranto (*ô-trân-tô*), seaport on s.e. coast of Italy 46 mi. s.e. of Brindisi; during Middle Ages chief Adriatic port of Italy; sacked by Turks (1480): *maps* I-156, B-18
Otranto, Strait of, passage connecting Adriatic and Ionian seas and separating Italy from Albania; minimum width about 45 mi.: *map* B-18
O'Trigger, Sir Lucius, in Sheridan's comedy 'The Rivals', fortune-hunting, duel-loving Irishman.
Ottakar II. See in Index Ottokar II
Ottar (9th century), Norwegian explorer P-279
Ottar, otto, or attar, of roses P-124
 Bulgaria B-270
Ottawa (*ô-tâ-wâ*), Ill., farming trade center on Fox and Illinois rivers, 70 mi. s.w. of Chicago; pop. 16,005; glass, pottery, brick and tile, agricultural implements; glass sand and fire clay near by: *map* I-13
Ottawa, Kan., city 50 mi. s.w. of Kansas City in farming and live stock section; pop. 10,193; steel products, tractors and airplane parts; Ottawa University.
Ottawa, Ontario, cap. of Dominion of Canada; pop. 126,872: O-254-5, *map* C-50c
 museum, *table* M-393
 Parliament Building, *picture* C-63
Ottawa, University of, at Ottawa, Ontario; Catholic; founded 1849, university charters in 1866 and 1889; arts, science, theology, philosophy, canon law, pedagogy, commerce.
Ottawa Indians, Algonquian tribe originally living about upper Ottawa River, Canada; driven out by

Six Nations to upper Michigan peninsula and later to lower peninsula, whence they spread into Ohio, Indiana, and Illinois
 Pontiac I-68
 raid Pennsylvania settlements P-117
Ottawa-Rideau Canal System C-69
Ottawa River, Canada, chief tributary of St. Lawrence; rises in Quebec, flows w., and then s.e., forming boundary between Quebec and Ontario; length 685 mi.; enters St. Lawrence by 2 channels inclosing island of Montreal: O-254, *map* C-50c
 Algonquian route G-150a
 canal system C-69
Ottawa University, at Ottawa, Kan.; Baptist institution founded 1865; arts and sciences.
Ot'ter, a weasel-like, aquatic mammal O-255, *pictures* O-255, N-31
 hunted by otterhound D-82
Otterbein (*ô-têr-bîn*), Philip William (1726-1813), American clergyman, born Germany; founded United Brethren in Christ.
Otterbein College, at Westerville, Ohio; founded 1847 and controlled by United Brethren; liberal arts, science, music, and fine arts.
Ot'terburn, village in n.e. England; Scots under Douglas defeated English under Percy 1388; battle celebrated in ballad of Chevy Chase.
Otter Creek, a river in w. Vermont, about 110 mi. long, *map* N-86
Otterhound D-82
Ottery St. Mary, village of Devonshire, England; birthplace of Coleridge; the Clavering of Thackeray's 'Pendennis': C-299
Ot'to I, or Otho I (912-973), Holy Roman emperor O-256
 empire, extent of G-71, I-162
 feudal power M-160
Otto II, or Otho II (955-983), emperor O-256
Otto III, or Otho III (980-1002), emperor O-256
 Charlemagne's tomb opened by A-1
Otto IV, or Otho IV (1175?-1218), emperor O-256
Otto (1848-1916), king of Bavaria; insane throughout reign (1886-1912); his uncle, Prince Luitpold, regent; deposed
 modern castles G-68
Otto (1815-67), king of Greece, son of Louis I of Bavaria G-162
Otto, Nicholas A., invented, 1876, four-cycle gas engine, an improvement of the "free-piston" engine of Otto and Langen 1867
 four-cycle gas engine G-20, A-397
Otto, ottar, or attar, of roses P-124
 Bulgaria B-270
Otto four-stroke cycle, of a gas engine A-397
Ot'tokar II, or Ottakar II (1230?-78), king of Bohemia; acquired Austria, Carinthia, Carniola, and Styria; later lost all except Bohemia and Moravia; famous in history and story as handsome, clever, brave.
Ot'toman Empire, former name of Turkish Empire.
Ottoman Turks, branch of Turks which founded and ruled Turkish Empire; named from Othman, first sultan (reigned 1288-1326): T-159, 160, 162-3
 Mesopotamia ruled by M-121
Ottum'wa, Iowa, center of agricultural and coal-mining district, 75 mi. s.e. of Des Moines on Des Moines River; pop. 31,570; abundant water power; agricultural implements, iron products, packed meat: *map* I-120

On, an Hawaiian song bird (*Psittirostra psittacea*).
Ouachita (*wâsh'i-tâ*) Mountains, outlying portion of main Ozark Plateau, s. of Arkansas River in Oklahoma and Arkansas; height 1500 to 2500 ft.: *maps* A-296, O-216
 Hot Springs resort. *picture* A-298
 whetstone rock A-295
Ouachita National Forest, Ark., national forest preserve in w. cent. part of state, so-named, 1926, by proclamation of President Coolidge; comprises 1,208,940 acres; it is part of the former Arkansas National Forest; in s.w. section of preserve are the Ouachita Mountains; trees mainly shortleaf pine and hardwoods.
Ouachita River, rises in w. Arkansas and flows s.e. across n. Louisiana to Red River near latter's junction with Mississippi: *maps* A-296, L-206
Oubangui Chari, colony in cent. French Equatorial Africa; about 238,000 sq. mi.; pop. 835,000; cap. Bangui: *map* A-42a
Oud, J. J. P. (born 1890), Dutch architect, modernist, born Purmerend, Netherlands; aimed for "purity of form, straightness of line, equilibrium of proportions"; important buildings in Amsterdam and Rotterdam.
Oudenarde (*ô-dâ-nârd'*), Belgium, town on Scheldt River 18 mi. s. of Ghent; victory of Allies under Marlborough and Prince Eugene of Savoy over French under Vendôme (1708).
Oudh (*oud*), former province, now part of United Provinces of Agra and Oudh, British India; 24,154 sq. mi.; pop. 12,795,000; chief city Lucknow: I-31
 Begum of, and Hastings H-234
Ouida. See in Index De la Ramée, Louisa
Ounce, the snow leopard, *picture* L-98
Ounce, unit of weight and measure, *tables* W-67, 68
'Our American Cousin', play by Tom Taylor; first produced 1858; at a performance of this play Lincoln was assassinated.
Our American Heritage, Outline U-256a-d
Our Lady of the Lake College, San Antonio, Tex.; Roman Catholic institution for women, founded 1911; arts and sciences, music, library science.
'Our Mutual Friend', novel by Charles Dickens (1865); two distinct plots are tied together by Mr. Boffin, the Golden Dustman, and his wife: D-66
Ourthe (*grt*), river of Belgium, flows n. 100 mi. to Meuse at Liège.
'Our Young Folks', a children's magazine L-162
Ouse (*g2*), or Great Ouse, river in s.e. England; about 160 mi. long; flows n.e. into The Wash; one of its tributaries is called the Little Ouse: *map* E-279
Ouse, river in Yorkshire, England; about 60 mi. long; flowing s.e., joins the Trent River to form the Humber: *map* E-270a
Ousel (*g'zl*), or ouzel, former name of the blackbird, now given to European and American dipper.
Outboard motor G-20, *picture* G-19
Outboard motor boats B-165
Outcault, Richard Felton (1863-1928), American comic artist and advertising man; born Lancaster, Ohio; created 'Hogan's Alley'; 'Yellow Kid'; 'Buster Brown' estimate of Caldecott L-107

Key—câpe, ât, fâr, fâst, what, fâll; mē, yēt, fērn, thēre; îce, bît; rōw, wōn, fōr, nōt, dō; câre, bût, ryde, fûll, bârri;

Outer Mongolia (Mongolian People's Republic) M-222a-23, map M-222c
Outfielder, in baseball B-54, 56b

Outlanders, or Uitlanders, Boer name for foreign immigrants in South Africa S-201-2, B-167

Outlines. See in Index Reference-Outlines

"Out of sorts," in printing T-173

Outram (q'trām), Sir James (1803-63), English general, hero of Indian Mutiny; given title "the Bayard of India" by Sir Charles Napier, his superior, when he defended the British residency at Hyderabad against 8000 Baluchis
Lucknow defense L-211

Outremont (q-trū-mōn'), Quebec, Canada, residential suburb n. of Montreal; pop. 28,641.

Outrigger, a device attached to the side of certain boats of narrow beam to prevent capsizing B-166, pictures B-162, P-2, 4

Ouzel. See in Index Ousel

Ova. See in Index Ovum

Oval window, of inner ear E-126, diagram E-127

Ovary, in flowering plants, the receptacle in which fertilized seed-germs develop F-120, pictures F-126-7

Oven
bakery B-230, picture B-231
coke C-298
primitive, pictures B-228, 229, C-307, I-171

Ovenbird, a warbler W-7

Overcasting, in sewing, diagram S-88

Overcup oak, tree (*Quercus lyrata*) of beech family, native from New Jersey to Florida and Texas. Grows to 100 ft.; leaves to 8 in. long with large terminal lobe. Wood is marketed as "white oak."

Overdrafts, on a bank B-40

Overglaze, of pottery P-328-30

Overhand knot K-34

Overland route to the West C-34, picture C-32

Overland stage, picture T-123

Overland trails, U.S. F-15-17, R-116

Overseas Departments, U. S. Army U-224

Overseer, in early church C-232

Overseer, of a plantation A-163

Overshot water wheel W-51

Overtone, or partial tone, in music S-197

Overture, in music, an introductory part to an opera or other musical work; a concert overture is an independent composition for band or orchestra.

Ovid (Publius Ovidius Naso) (43 B.C.-18 A.D.), Roman poet L-69

Oviedo (ō-vē-ā'dō), industrial city of n. Spain, 16 mi. s. of Bay of Biscay; pop. 76,000; university; plundered by French in Peninsular War (1809 and 1810): map S-226

Oviedo y Valdés (ō'vē-ā'dhō ē vāldās'), Gonzalo Fernandez de (1478-1557), Spanish chronicler and colonial official; his rambling "History of the West Indies" is full of strange, sometimes inexact, information on native customs, animals, plants

Ozama fortress, picture S-27

Ovip'arous, name applied to animals that lay eggs E-192, I-86

Ovipos'itor, egg-laying organ of insects I-87
grasshopper, picture G-138
ichneumon fly I-6

O'vis, the sheep genus of animals

Oris poli, or Marco Polo sheep S-105, E-346

Ovule (ō'vūl), the cell which forms the embryo plant after fertilization F-120

fertilization of, pictures F-126-7

O'vum, an egg, or female reproductive cell H-283b

Owen, Sir Richard (1804-92), English biologist, conservator of museum Royal College of Surgeons; superintendent natural history department British Museum ('Memoir on the Pearly Nautilus'; 'Odontograpy').

Owen, Robert (1771-1858), English Utopian socialist S-180

Owen, Ruth Bryan (Mrs. Boerge Rohde) (born 1885), American politician and lecturer, born Jacksonville, Ill.; daughter of William Jennings Bryan; lyceum and chautauqua lecturer 1919-28; congresswoman from Florida 1929-33; minister to Denmark 1933-1936 ('Leaves from a Greenland Diary'; 'The Castle in the Silver Wood').

Owensboro, Ky., center of farm and mine region and tobacco market, 80 mi. s.w. of Louisville; pop. 30,245; tobacco, clay, brick, tile, wood products, canned foods, wagons, machinery: map K-11

Owens Lake, Calif., 12 mi. e. of Mt. Whitney; about 18 mi. long and 10 mi. wide; receives Owens River at n. end: map C-26
borax deposits B-192, 194
how formed D-113a

Owen Sound, Ontario, Canada, port at mouth of Sydenham River, on Owen Sound, inlet of Georgian Bay; in farm and fruit-growing region; pop. 12,839; grain, lumber; iron and steel products: map C-50c

Owens River, in s.e. California, flows s.e. and s. 175 mi. to Owens Lake.

Owen Stanley Mountains, in s.e. New Guinea; scene of battle action 1942: map E-142a

Owen submachine gun, picture M-9

OWI (Office of War Information) N-12n, U-232

Owl, a nocturnal bird of prey O-256-7
Arctic regions A-278
barn O-256, picture O-256, color plate B-135

barred O-256-7, pictures O-256, N-33
feathers O-257, picture F-20
feeding habits B-122, O-256

foot O-257, picture B-129
horned O-257, pictures O-257, B-123

incubation of eggs B-128
kinds O-256-7

length of life, pictograph A-198
long-eared O-256

parasite of, picture P-69
screech O-257, pictures O-257, N-33, color plate B-135: protective coloration, picture B-131

spectacled, picture O-256

Owlet-moth, moth (family Noctuidae) of the cutworm C-418

Owos'so, Mich., city 75 mi. n.w. of Detroit on Shiawassee River; pop. 14,424; beet-sugar industry; iron products, furniture: map M-153

Owyhee Dam, in Oregon, an arch dam. table D-357

Ox (plural oxen) C-106. See also in Index Cattle

Costa Rica, picture C-374
early use in North America T-121, 124, picture S-223

Honduras, picture C-133b
Peru L-67d

Oxalic acid, poisonous crystalline compound (C₂H₂O₄) found in many plants (especially in wood sorrel or oxalis); artificially made by oxidizing sugar, starch, cellulose, etc., by nitric acid, or by fusing caustic alkalis with compounds having oxy-

gen; used in bleaching, dyeing, and making certain chemicals
antidote L-138

Oxalis (ōk'sā-līs), a genus of plants with acid-tasting, clover-like leaves; flowers red, violet, yellow, or white; both flowers and leaves fold or "sleep" at night; wood sorrel a type in the United States.

Oxalis family, or Oxalidaceae (ōks-āl-i-dā'sē-ē), a family of plants and trees including the violet wood-sorrel, ladys sorrel or sour grass, yellow wood-sorrel, Bermuda buttercup, oka, bilimbi, and carambola; also called wood-sorrel family.

Oxbow lakes, how formed L-55

Ox-cart

Armenia, picture A-302

Spain, picture S-231b

United States, pictures S-223, T-123

Oxenstjerna (ōks'ēn-shēr-nā), Count Axel Gustafsson (1583-1654), noted Swedish statesman; became chancellor 1616; showed great ability in directing foreign policy and home government of Sweden; held absolute control in central Germany during Thirty Years' War; guardian of Queen Christina, who opposed him: S-340

Oxeye. See in Index Heliopsis

Ox-eye daisy, a species of chrysanthemum D-5

Ox family, or Bovinae, a subfamily of hollow-horned ruminant mammals, including cattle, bison, buffaloes, and yaks.

Ox'ford, England, famous university town, 52 mi. n.w. of London; pop. 81,000: O-258-61, map E-270a
University, picture E-174

Oxford, Miss., cotton-growing center 60 mi. s.e. of Memphis, Tenn.; pop. 3433; state university: map M-200

Oxford, Ohio, town in farming region 30 mi. n.w. of Cincinnati; pop. 2756; Miami University, Western College.

Oxford and Asquith, Herbert Henry Asquith, first Earl of (1852-1928), English statesman, for many years leader of Liberal party; stood for many governmental reforms, one of which deprived the House of Lords of its veto power; sympathized with Irish struggle for home rule; opposed woman suffrage; as prime minister (1908-16) was criticized for his conduct of the government during the 1st World War. and was succeeded by Lloyd George; created earl in 1925
Home Rule Bill passed I-128
Lloyd George and L-173, 174

Oxford and Asquith, Margot, Countess of (born 1864), English writer, wife of first Earl of Oxford and Asquith; her autobiography made sensation in European society; later works received less attention ('The Autobiography of Margot Asquith'; 'Places and Persons'; 'Octavia'; 'Myself When Young').

Oxford Down, a breed of sheep S-106

Oxford Groups, informal associations of the followers of Buchmanism, founded at Oxford University in 1921 by Frank N. D. Buchman. See in Index Buchmanism

Oxford India paper P-61

Oxford Movement, a religious movement in the Anglican church (beginning 1832) whose aim was to restore to the Church of England some of the doctrines and practices abandoned at the time of the Reformation

Newman's part N-94

Oxford Reformers, in English Renaissance M-257

Ox'fordshire, county of s. cent. Eng-
land; 736 sq. mi.; pop. 129,000;
agriculture, stock raising, manufac-
turing; county town, Oxford.

Oxford University O-258-61, *picture*
E-174

Bodleian Library L-105, *picture*
L-106a

Christmas, boar's head ceremony
C-227

excavations at Kish K-25

religious restrictions removed G-98

Rhodes scholarships R-99-100

Ox Hill, battle of. *See in Index* Chan-
tilly, Va.

Ox'idase, ferment that produces oxi-
dation B-110

Oxida'tion, chemical union of any sub-
stance with oxygen or other nega-
tive element or radical C-171, *pic-
ture* C-173

alloys to prevent A-130

animal heat and energy caused by
B-110

candle flame and Bunsen burner
B-272-3

fire (rapid oxidation) F-45

rust (slow oxidation) R-198-9

thermit reaction A-139

Oxides (ôks'idz), compounds of oxy-
gen with some other element
M-182, 183

aluminum A-138, H-201: in synthetic
gems G-26

arsenic A-310

calcium (lime) L-138

carbon C-82

cement produced with C-128

copper C-361

iron I-135: rust R-198-9

nitrogen N-147: nitric oxide F-219,
N-147; nitrous oxide A-196

silicon S-143

sulphur S-323, 324

tin T-98

zinc Z-217, P-32

Ox'us River, Asia. *See in Index* Amu
Darya

Oxyacet'ylene torch, used in cutting
and welding metal A-7

Oxygen (ôks'i-jén), a gaseous ele-

ment O-261-2, C-175, *table* C-168.
See also in Index Oxidation; Oxides
air contains A-61, O-261, H-374, *pic-
ture* A-62

aluminum, affinity for A-139

amount in earth, *diagram* C-167

atomic structure O-262, *diagram*
A-361

atomic weights O-262: standard for
comparisons C-167b

body requires O-261-2, R-79-80:

blood B-157a; fatigue remedied by
B-110; high altitude affects A-62;

lungs, function L-219

combustion O-261, F-45: candle
flame and Bunsen burner B-272-3

dyes, color caused by D-122

electrolysis produces, *picture* C-166

explosive mixtures E-348

heavy oxygen O-262, A-362

lightness, comparative G-18

liquefied L-155

plants breathe P-238-9

protoplasm contains B-109

rusts iron R-198-9

specific gravity P-190

symbol, chemical, *picture* C-167a

valence C-170, *diagram* C-170, *pic-
ture* C-176a

water formation W-46, *diagram*

C-170: experiment O-261; free
oxygen O-262

yeast plants extract Y-204

Ox'ygen mask, *picture* A-71

Ox'yhemoglobin, combination of oxy-
gen and hemoglobin found in ar-
terial blood B-157a, B-110

Oxyhydrogen flame, used in blowpipe
to cut metal H-368

Oyama (ô'yä-mä), Iwao, Prince
(1842-1916), Japanese field mar-
shal; captured Port Arthur in war
with China; commander in chief in
Russo-Japanese War; important
victory over Russians at Mukden.

Oyster Bay, N.Y., residential center
and summer resort on Long Island,
30 mi. n.e. of New York City; home
of Theodore Roosevelt: *map* N-114

Oyster catcher, a shore-bird of the
stilt family; long-legged, wedge-
pointed, red bill; common American

species (*Haematopus palliatus*) 18
to 20 inches long; brown with black
head and neck; feeds on oysters,
clams, and mollusks; also called
mussel picker and sea pie.

Oyster drill, a boring snail S-168

Oyster plant. *See in Index* Salsify

Oysters O-262-6

anatomy, *picture* O-265

blue points O-265, L-195

culture O-265-6

enemies O-264: oyster drill snail
S-168; starfish O-264, S-276, *pic-
ture* S-277

food value O-266

harvesting and marketing O-265, *pic-
tures* O-263, V-305

partnership with pea-crab C-388

pearl oyster P-97, *pictures* O-265

producing regions O-262

United States O-262, 265: Louisiana
L-206; Maryland M-76; New
Jersey N-92; New York L-195;

South Carolina S-214; Virginia
V-304, *picture* V-305

reproduction O-262, E-192

Oyster-shell scale S-35

Oz, Land of, an imaginary fantastic
land, described by L. Frank Baum
in 'The Wonderful Wizard of Oz'
and other "Oz" books for children.

Ozark (ô'zärk) Mountains, a low pla-
teau in the Mississippi Valley be-
tween the Missouri and Arkansas
rivers O-266, *maps* A-296, U-200,
M-208

Arkansas A-295, 296

log cabin, *picture* P-221c

minerals U-195, O-266, *map* A-296

Missouri M-207, 208

Ozarks, Lake of the O-266. *See also in
Index* Bagnell Dam

Ozea, Mount, formerly Parnes, in
Greece, 15 mi. n. of Athens; 4600
ft.: A-353

Ozokerite (ô-zô-kê'rît), or mineral
wax P-145, A-337

used in electrotyping E-243

Ozone (ô'zôn), a very active form of
oxygen O-262

sunspots increase S-329